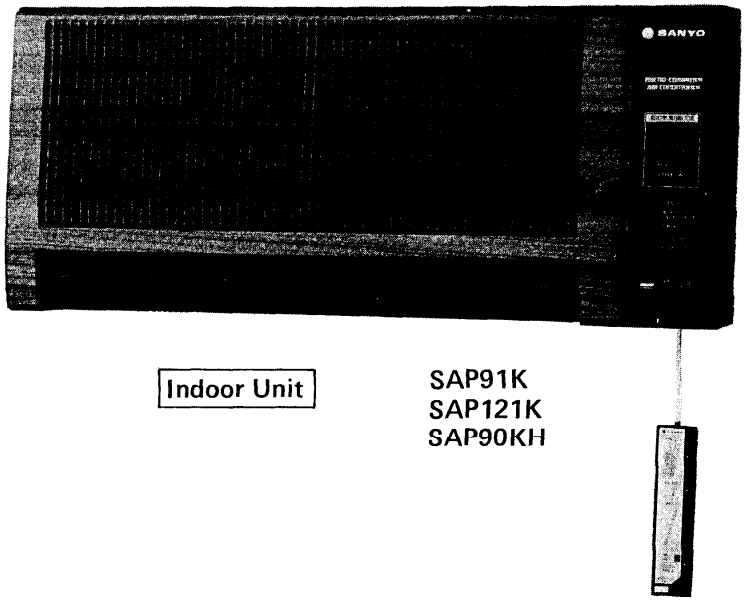
SERVICE MANUAL

SANYO

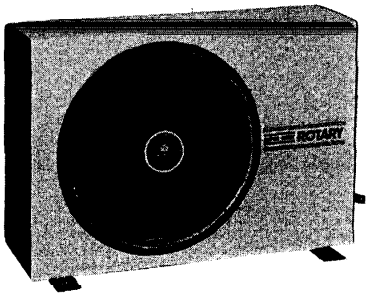
SPLIT-TYPE AIR CONDITIONERS

SAP91KC SAP121KC SAP90KCH



Indoor Unit

SAP91K
SAP121K
SAP90KH



Outdoor Unit

SAP91C
SAP121C
SAP90CH

WM-12138

AIR CONDITIONERS ONLY LIMITED WARRANTY

Sanyo Electric Inc. takes pride in its products and believes they are manufactured to the highest possible standards. Consequently, Sanyo warrants to the original consumer its air conditioning unit to be free from detects in materials and workmanship for a period of one (1) year from the original purchase date. The compressor part only of the air conditioner is warranted for a total of five (5) years (part only). Sanyo will, at its option, repair any unit covered by this warranty without cost to the consumer for either parts or labor. Sanyo will require an original sales slip or bill of sale before instituting any repairs under this warranty.

Sanyo specifically excludes from this warranty any non-electric/mechanical attachments and accessories and disposable parts. For example, these items include air filters, improper connection between the ground wire and the pipe, knobs, cosmetic repair, initial installation of the air conditioner, use of improper line voltages are considered non-warranty items. Also, Sanyo assumes no liability and does not guarantee or warrant any repairs and/or replacement parts not supplied or performed by an authorized Sanyo Service Center; any conversions; damage caused by or failure to follow the owner's manual as to adjustments and/or maintenance abuse, misuse, neglect, accident, fire, flood, or other acts of God are excluded from this warranty.

This warranty is void and of no effect if any serial numbers on the Sanyo product are altered, replaced, defaced or missing. This Sanyo warranty is only for Sanyo products purchased and used in the continental United States.

Sanyo realized that some of its larger appliances cannot be taken to the nearest authorized service station. Consequently, as to its air conditioners, in home service by an authorized service center is covered by this warranty.

In those cases where only parts are warranted, the consumer will be responsible for the labor charges. In addition, transportation costs for all units are the sole responsibility of the consumer. No consumer telephone claims will be allowed.

This is the entire warranty and it may not be changed or amended by any person, agency, distributor, dealer or company without prior written authority from Sanyo Electric Inc.

This warranty gives the consumer specific legel rights but he may have other legal rights which may vary from state to state. Sanyo assumes no liability and indeed specifically denies responsibility for any consequential damages beyond the repair or replacement of air conditioning units.

Should the consumer need repairs or assistance in locating his nearest Sanyo Authorized Service Station, he may call or write to Sanyo Electric Inc. as follows:

EAST and SOUTH

Sanyo Appliance Service Center
200 Riser Road
Little Ferry, New Jersey 07643
(201) 641-2333

WEST

Sanyo Appliance Service Center
1200 W. Artesia Blvd.
Compton, California 90220
(213) 537-5830

7/84

SANYO SPLIT TYPE AIR CONDITIONERS SERVICE MANUAL

Models: SAP91KC
SAP121KC
SAP90KCH

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1. SPECIFICATIONS

1.1. Unit Specifications

Model No.		SAP91KC		SAP121KC	
Unit Model No.	Indoor Unit Outdoor Unit	SAP91K SAP91C		SAP121K SAP121C	
PREFORMANCE & ELECTRICAL RATINGS					
Capacity	BTU/hr.	9,000		12,000	
Moisture removal (High)	Pints/hr.	2.2		3.5	
Air circulation (High)	Cft/min.	260		340	
SEER (EER)	BTU/wh	10.1 (10.0)		10.1 (10.0)	
Voltage rating	V	115		115	
Running amps	A	8.0		10.6	
Power input	W	900		1200	
FEATURES					
Controls		Microcomputer		Microcomputer	
Fan speeds		Hi./Med./Lo. + Automatic		Mi./Med./Lo. + Automatic	
Timer		ON/OFF 12-hour		ON/OFF 12-hour	
Ventilator		–		–	
Air deflection	Horizontal Vertical	Manual Manual		Manual Manual	
Air filter		Washable, Easy slide out		Washable, Easy slide out	
Other special features		Energy Saver Night Setback Filter Check		Energy Saver Night Setback Filter Check	
Temperature control		IC Thermostat (Microcomputer-Based)		IC Thermostat (Microcomputer-Based)	
Refrigerant (R22)	lb. (g)	2.36 (1070)		2.51 (1140)	
Refrigerant Piping System	ft. (m)	Flare		Flare	
Refrigerant Piping Length	ft. (m)	Max. 33 (10)		Max. 33 (10)	
Refrigerant Piping Kit		Option		Option	
DIMENSIONS & WEIGHT		Indoor Unit	Outdoor Unit	Indoor Unit	Outdoor Unit
Dimensions	Height in. (mm) Width In. (mm) Depth In. (mm)	13-9/16 (345) 31-1/2 (800) 6-7/8 (175)	20-7/8 (530) 29-17/32 (750) 11-1/32 (280)	13-9/16 (345) 38-31/32 (990) 6-7/8 (175)	20-7/8 (530) 29-17/32 (750) 11-1/32 (280)
Net weight	lbs (kg)	24.2 (11)	88 (40)	28.6 (13)	90.2 (41)
FUSE (or CIRCUIT BREAKER)		15 Amps. 125V		15 Amps. 125V	

DATA SUBJECT TO CHANGE WITHOUT NOTICE.

Model No.		SAP90KCH	
Unit Model No.	Indoor Unit Outdoor Unit	SAP90KH SAP90CH	
PERFORMANCE & ELECTRICAL RATINGS		COOLING	HEATING
Capacity	BTU/hr.	9,000	10,800
Moisture removal (High)	Pints/hr.	2.2 (1.25)	
Air circulation (High)	Cft/min.	260 (450)	
SEER (EER)	BTU/wh	10.4 (10.0)	C.O.P. 3.5
Voltage rating	V	115	115
Running amps	A	8.0	8.1
Power input	W	900	900
FEATURES			
Controls		Microcomputer	
Fan speeds		Hi./Med./Lo. + Automatic	
Timer		ON/OFF 12-hour	
Ventilator		—	
Air deflection	Horizontal Vertical	Manual Manual	
Air filter		Washable, Easy slide out	
Other special features		Energy Saver Night Setback Filter Check	
Temperature control		IC Thermostat (Microcomputer-Based)	
Refrigerant (R22)	lb. (g)	2.64 (1200)	
Refrigerant Piping System		Flare	
Refrigerant Piping Lenght	ft. (m)	Max. 33 (10)	
Refrigerant Piping Kit		Option	
DIMENSIONS & WEIGHT		Indoor Unit	Outdoor Unit
Dimensions	Height In. (mm) Width In. (mm) Depth In. (mm)	13-9/16 (345) 31-1/2 (800) 6-7/8 (175)	20-7/8 (530) 29-17/32 (750) 11-1/32 (280)
Net weight	lbs (kg)	24.2 (11)	90.2 (41)
FUSE (or CIRCUIT BREAKER)		15 Amps. 125V	

DATA SUBJECT TO CHANGE WITHOUT NOTICE.

1

1.2. Major Component Specifications

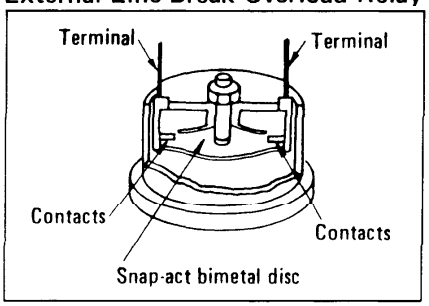
Unit Model No.	SAP91C	SAP121C	SAP90CH
COMPRESSOR	Hermetic Rotary Type		
Compressor Model No.	C-R70H2V	C-R90H2S	C-R70H2V
Source	115V, 60Hz, Single Phase		
Pole	2	2	2
Nominal output (W)	700	900	700
Displacement (cc/rev.)	13.3	17.5	13.3
Amps. —Full Load (A) —Locked Rotor (A)	7.8 49	10.1 60	7.8 49
Type of oil	* Special Oil for Rotary Compressor		
Compressor oil amount (cc)	500	650	500
Coil resistance (Ω) (Ambient temp. 77°F)	C-R: 1.43 C-S: 5.24	C-R: 0.57 C-S: 2.71	C-R: 1.43 C-S: 5.24
Protective Device	External Line Break Overload Relay		
Run Capacitor, 330V (MFD)	30	35	30

Unit Model No.	SAP91K/SAP90KH	SAP91C/SAP90CH	SAP121K	SAP121C
FAN MOTOR	Capacitor-Run Induction Motor			
Fan Motor Model No.	SV4T-11C1P	FT6-21A1P	FV4T-11F1PE	FT6-21C1PE
Source	115V, 60Hz, Single Phase			
Pole	4	6	4	6
Nominal output (W)	10	10	20	20
Amps. —Full Load (A) —Locked Rotor (A)	0.26 0.33	0.64 0.69	0.34 0.44	0.69 0.79
Protective Device	Internal Protector (9700K 211-215)			
Run Capacitor, 220 (MFD)	2	6	3.5	8
Coil Resistance (Ω)	BLU-BRN: 137.2 BLU-VLT: 63.0 VLT-YEL: 28.3 YEL-PNK: 159.8	BLU-BRN: 68.9 BLU-PNK: 103.9	BLU-BRN: 99.6 BLU-VLT: 29.7 VLT-YEL: 16.2 YEL-PNK: 103.9	BLU-BRN: 62.5 BLU-PNK: 59.1

* Contact Sanyo Electric Inc. for details.

Unit Model No.	SAP91C/SAP90CH	SAP121C
OVERLOAD RELAY, COMPRESSOR		
Model No.	MRA98675	MRA98693
Temps. —Operating —Reset	293±41°F 156±52°F	329±41°F 156±52°F
Amps. at 77°F (Cold Start)	Operates within 6 – 16 sec. at 39.5A	Operates within 6 – 16 sec. at 43A
Amps. at 176°F (Cold Start)	Not operates for 30 min. at 15.8A	Not operates for 30 min. at 29.8A
Reset	Automatic	Automatic

External Line Break Overload Relay

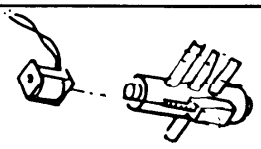


Unit Model No.	SAP91C/SAP121C/SAP90CH	Figure
PTC Thermistor (for compressor starting)	**PTH491A04AR470N500**	
Resistance at 69°F (Ω)	47	

Unit Model No.	SAP91K/SAP121K/SAP90KH	Figure
Room Temp. Sensor *1	**OCS-5K**	Incorporated in the remote control unit.
Resistance (kΩ)	69°F: 6 – 6.5 77°F: 4.9 – 5.2 86°F: 3.9 – 4.2	

Unit Model No.	SAP90KH	Figure
Indoor Coil Temp. Sensor *1	**WTC-51H**	
Resistance (kΩ)	32°F: 185 86°F: 45 – 50 50°F: 112 122°F: 15 – 25 68°F: 69.8 140°F: 8 – 19.5	

Unit Model No.	SAP90CH	Figure
Outdoor Coil Temp. Sensor *2	**TSR-12M160UL**	
Characteristics	OFF: 50 – 54°F ON: 39°F Diff.: Less than 46 deg. F	

Unit Model No.	SAP90CH	Figure
4-Way Reversing Valve	**L279069 (Coil)** **V269000 (Valve Ass'y)**	
Coil voltage	120 V, 60 Hz	

Unit Model No.	SAP91K/SAP121K/SAP90KH	Figure
Power Transformer (for controller PCB)	**ATR-J121U1**	
Resistance (Ω)	Primary: WHT – WHT 36.5 Secondary: BRN – BRN 1.2	

NOTES: *1 = Thermistor *2 = Lead Switch

1.3. Compressor Identification

1. Marking (Stamped)

Compressor code No. → **806 717 42**

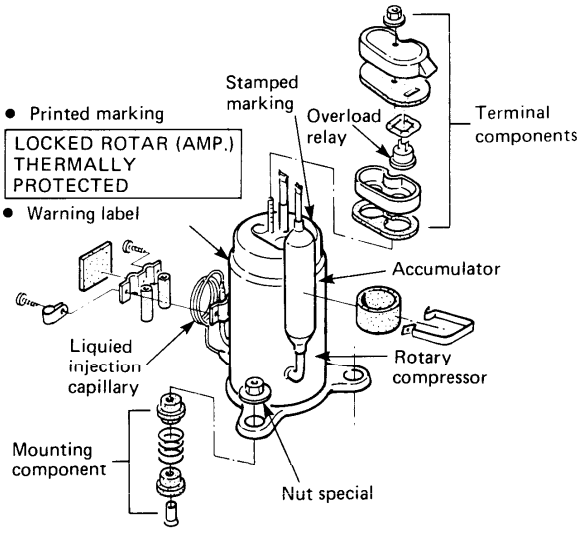
Model No. → **C – R70H2V** [TSE]

Manufacturer:
T = Tokyo
S = Sanyo
E = Electric.

Production Date → **30 01 4** ← (=30 Jan., 1984)

Ratings (V) → **V115**

Frequency (Hz) and Phase → **HZ60 PH1**



2. Compressor Code No.

806 717 42

- 806: Figures to express Compressor Type (806 means ROTARY)
- 717: Figures to express Nominal Output (Approx. Watts)
- 42: Design Serial No.
- 4: Phase & Application — 4: 1-PH & High Back Pressure
- Voltage — 1: 115VAC/60Hz; 2: 115VAC/60Hz; 3 208. 230VAC/60Hz

WARNING-SERVICEMAN

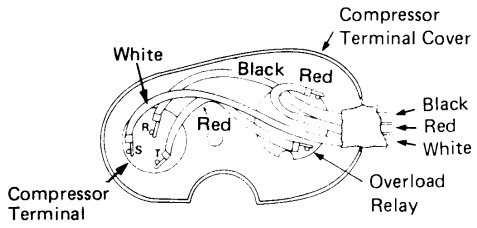
1. FIELD SERVICE LEAK TEST PRESSURE MUST NOT EXCEED 150 P.S.I.G.
2. THIS COMPRESSOR MUST BE GROUNDED.
3. DO NOT OPERATE WITHOUT PROTECTIVE COVER OVER TERMINALS: DISCONNECT ALL POWER BEFORE REMOVING THE PROTECTIVE COVER.

CAUTION

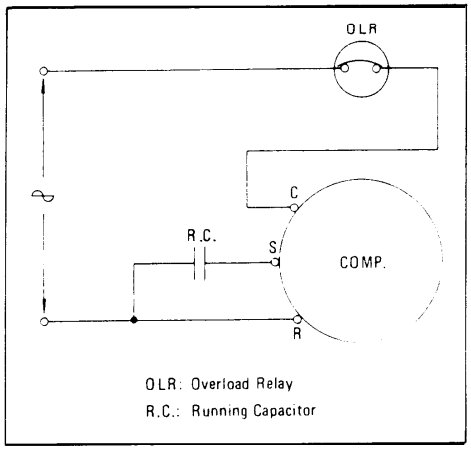
COMPRESSOR HOUSING MAY REACH 302°F (150°C) WITH TERMINAL PROTECTOR APPROVED BY TOKYO SANYO AND TESTED IN ACCORDANCE WITH UL984–1981.
TOKYO SANYO ELECTRIC CO.,LTD.

3. Compressor Wire Orientation

SAP91C/SAP121C/SAP90CH

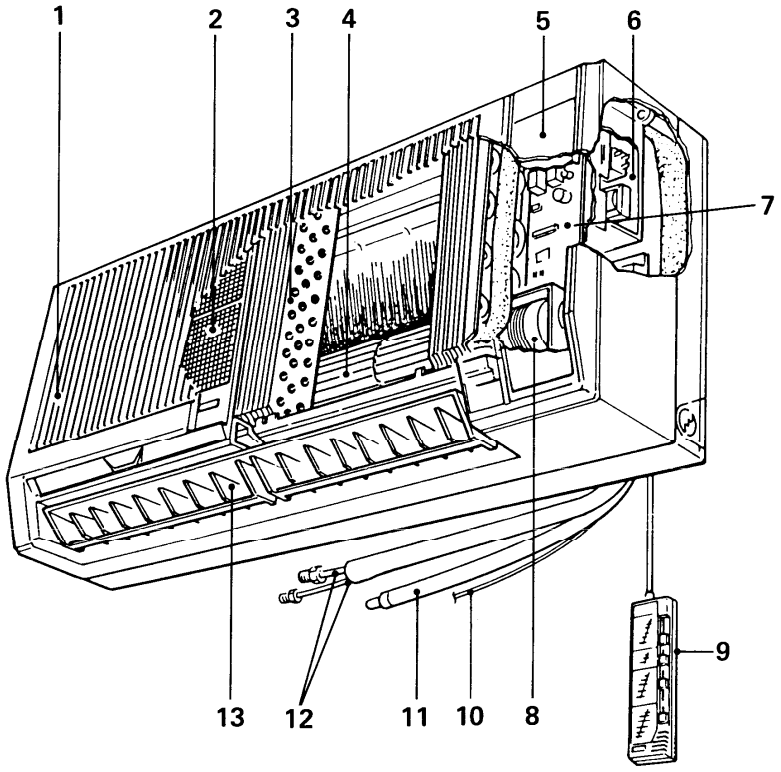


Wiring Diagram



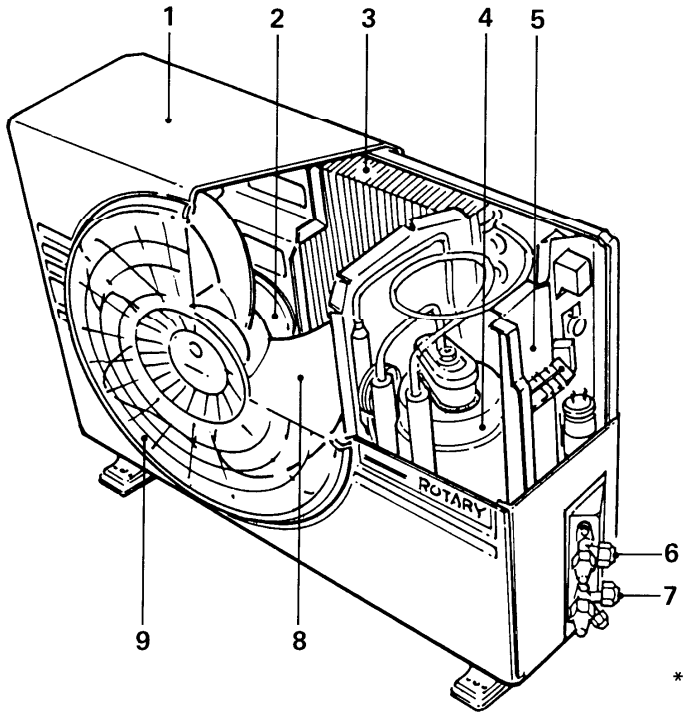
2. CONSTRUCTION OF THE UNIT

INDOOR UNIT SAP91K/SAP121K



1. Air intake
2. Air filter (slide-out)
3. Evaporator (=Indoor heat exchanger)
4. Indoor Fan
5. Casing
6. Electrical component box
7. Controller PCB
8. Fan motor
9. Remote control unit
10. Interunit Wiring
11. Drain hose
12. Refrigerant piping
13. Air outlet

OUTDOOR UNIT SAP91C/SAP121C



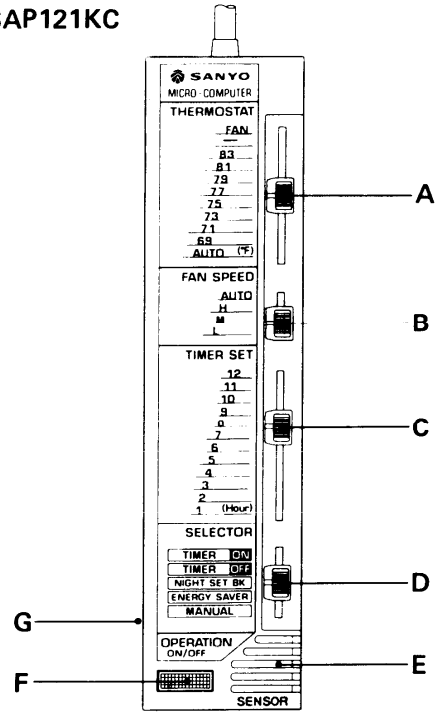
1. Cabinet
2. Fan motor
3. Condener (=Outdoor heat exchanger)
4. Compressor
5. Electrical component box
6. Service valve (Narrow pipe)
7. Service valve (Wide pipe)
8. Outdoor fan
9. Fan guard

* Construction drawings of SAP90KH (Indoor Unit) and SAP90CH (Outdoor Unit) are omitted.

3. OPERATING INSTRUCTIONS

1. CONTROL PANEL

SAP91KC
SAP121KC



A. THERMOSTAT
You can regulate room temperature to the desired comfort level by adjusting this lever. For fan operation without cooling move lever to "FAN".

B. FAN SPEED
Choose either AUTO matic speed selection or High, Medium or Low.

C. TIMER SET
Used to set hours of air conditioner running time.

D. SELECTOR
TIMER ON
TIMER OFF
NIGHT SET BK
ENERGY SAVER
MANUAL

*For detailed function of each position, see pages 8 & 9.

E. TEMPERATURE SENSOR
Electronically senses the room temperature and feeds data to the microcomputer.

F. OPERATION ON/OFF
This button starts and stops the air conditioner.

G. TEST RUN (Left side)
Set the lever to this position only when performing a test cooling operation.
Never leave the lever in this position. Otherwise, the evaporator coil may freeze up.

CAUTION:
Do not set a selector lever between two indicated positions. It must click into position.

2. MONITOR PANEL

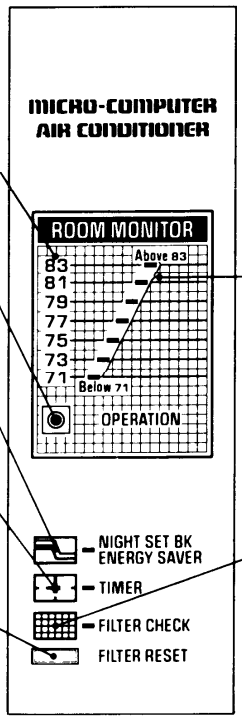
TEMPERATURE SCALE

OPERATION LAMP
This lamp is lit when the unit is operating.

SAVING MODE LAMP
This lamp is lit when the unit is operating with the NIGHT SET BK (BACK) or the ENERGY SAVER Feature selected.

TIMER LAMP
This lamp is lit when the unit is operating with the TIMER on.

FILTER RESET BUTTON
When the FILTER RESET button is pressed, the FILTER CHECK lamp goes off. And begins to record usage time.



ROOM TEMPERATURE GUIDE LAMPS
These lamps indicate the approx. room temperature where the control unit is installed.

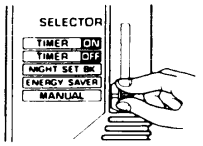
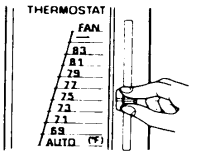
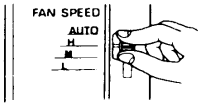
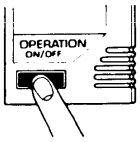
NOTE:
When the room temperature is 83°F or over, the "83" lights. When the room temperature is 71°F or less, the "71" lights.

FILTER CHECK LAMP
When lamp is lit, the air filter must be cleaned.

NOTE:
- When power is supplied to the unit, FILTER CHECK lamp is lit. After checking the condition of the filter, and cleaning it if needed, depress the FILTER RESET button.
- FILTER CHECK lamp is also lit when power is interrupted. To turn off the lamp, depress FILTER RESET button.

■ How to start air conditioner

(Manual cooling operation)

1	Set the SELECTOR lever to "MANUAL" position.	
2	Set the THERMOSTAT lever to the desired temperature.	
3	Set the FAN SPEED selector lever to either "AUTO", "High(H)", Medium(M)", or Low(L)" position.	
4	Depress the OPERATION button.	

■ How to stop

Depress the OPERATION button again to stop the air conditioner.

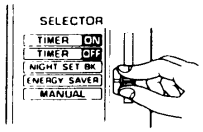
CAUTION:

When room temperature is lower than the set temperature, only the indoor fan will operate. If you want the unit to operate in the cooling mode, turn the thermostat lever towards the "69" direction.

When the operation button is depressed to start the unit, the outdoor unit will not start operating for three minutes to protect compressor from overloading. Thereafter, it will start operating normally.

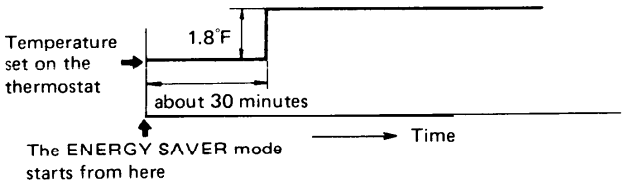
■ ENERGY SAVER operation

Set the SELECTOR lever to "ENERGY SAVER" position.



Next depress the OPERATION button.
(The ENERGY SAVER lamp and OPERATION lamp will light up.)

- In ENERGY SAVER mode, temperature setting on the thermostat is automatically maintained 1.8°F higher 30 minutes after starting the air conditioner. Room temperature is regulated to this setting, resulting in power saving. Relative comfort is retained due to dehumidification.

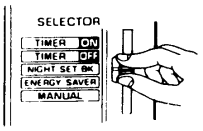


- When the room temperature reaches the preset temperature on the thermostat, both outdoor and indoor units stop simultaneously. This serves to prevent moisture around the indoor coil from blowing back into the room. At the same time, it saves electricity while the air conditioner is coming to a halt.

NOTE:
In both ENERGY SAVER and NIGHT SET BK modes, indoor fan stops 30 seconds after the compressor is shut down. At the start of compressor, indoor fan follows immediately.

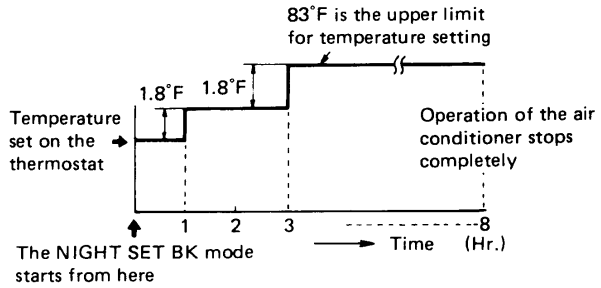
■ NIGHT SET BK operation

Set the SELECTOR lever to "NIGHT SET BK" position.



Next, depress the OPERATION button.
(The NIGHT SET BK lamp and OPERATION lamp will light up.)

- One hour after the NIGHT SET BK is put in operation, the temperature on the thermostat is raised 1.8°F from the initial set temperature, two hours later, it raises another 1.8°F. The air conditioner operates under this condition for eight hours. Then, the unit stops completely. This mechanism prevents room temperature from being reduced excessively and creates a comfortable condition for sleeping.



- Temperature setting must be reset for daytime use and unit turned on.

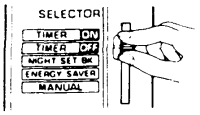
- In NIGHT SET BK mode, both outdoor and indoor units stop operation at preset temperature on the thermostat. This prevents room from increasing in humidity.

■ TIMER operation

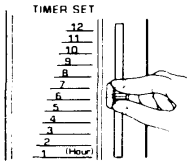
a. SET OFF mode

At the set time, operation will stop.

1. Set SELECTOR lever to the "TIMER OFF" position.



2. Set the TIMER SET lever to the desired time. (When the timer is set at "6" as shown in the illustration at the right, the air conditioner will stop operation six hours later.)

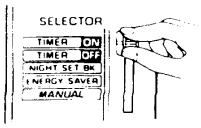


3. Depress the OPERATION button. (The TIMER lamp and OPERATION lamp will light up.)

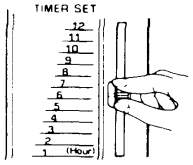
b. SET ON mode

At the set time, operation will start.

1. Set SELECTOR lever to the "TIMER ON" position.



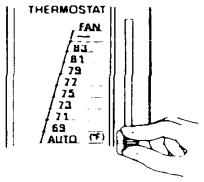
2. Set the TIMER SET lever to the desired time. (When the timer is set at "6" as shown in the illustration at the right, the air conditioner will start operation six hours later.)



3. Depress the OPERATION button. (Only the TIMER lamp will light up.)

■ *Setting the thermostat for AUTOmatic* operation

When you set the THERMOSTAT lever at the "AUTO" position, depending on the room temperature at the time of the setting, the temperature will automatically be set at: *



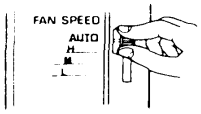
*

Room temperature when the unit starts	Setting temperature (Automatic)
83°F or over	79°F
Between 82 and 79°F	77°F
78°F or below	75°F

Note: If you want the unit to operate lower than 75°F, use MANUAL selector and adjust THERMOSTAT lever.

■ FAN SPEED control

1. Automatic control of FAN SPEED



Set the FAN SPEED selector to "AUTO" position.

When fan speed is set at AUTO, the unit automatically decides the fan speed by the room temperature and the setting of thermostat.
The relationship between temperature conditions and fan speed are as shown below:

When difference between room temperature and set temperature is	FAN SPEED
3.6°F or over	High
Between 3.5 and 1.8°F	Medium
1.7°F or below	Low

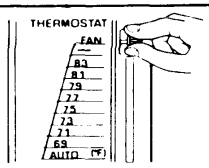
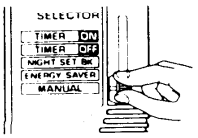
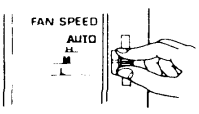
2. Manual control of FAN SPEED

(Cooling Operation)

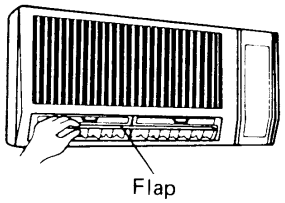
For rapid cooling of a room, set fan speed to High until desired comfort level is reached.
For continuous draft free operation set speed at Low or Medium.

3. Manual control of FAN SPEED

(Fan only operation)

1	Set the THERMOSTAT lever to "FAN" position.	
2	Set the SELECTOR lever to "MANUAL" position.	
3	Set the FAN SPEED to the desired level	
4	Depress the OPERATION button.	

Air Flow Direction Adjustment

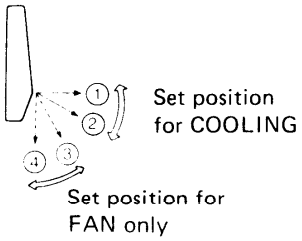


1. Adjustment in vertical direction

The air flow can be regulated in the vertical direction as follows:
Hold at both ends of the flap and move it up or down as required.
During cooling operation, be sure to set the flap at position 1 or 2 for cooling.

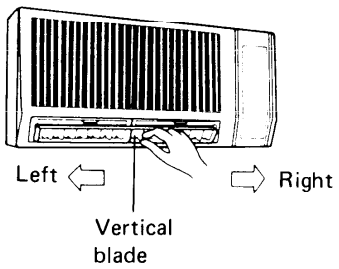
CAUTION:

- If the flap is set at position "3" or "4", condensation may form near the air outlet grille and drip on the floor.
- We recommend that position "3" or "4" be used only when the air conditioner is operating in the FAN mode.



2. Adjustment in horizontal direction

The air flow can be regulated in the horizontal direction as follows:
Move the vertical blades with fingers either left or right.



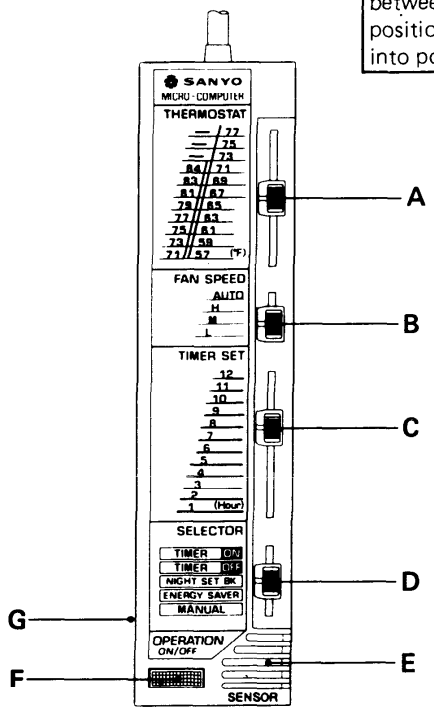
1

3. OPERATING INSTRUCTIONS

1. CONTROL PANEL

SAP90KH

CAUTION:
Do not set a selector lever between two indicated positions. It must click into position.



A. THERMOSTAT
You can regulate room temperature to the desired comfort level by adjusting this lever. For fan operation without cooling move lever upward as far as it goes.

B. FAN SPEED
Choose either AUTOmatic speed selection or High, Medium or Low.

C. TIMER SET
Used to set hours of air conditioner running time.

D. SELECTOR
TIMER ON
TIMER OFF
NIGHT SET BK
ENERGY SAVER
MANUAL

*For detailed function of each position, see pages 12, 13, and 14.

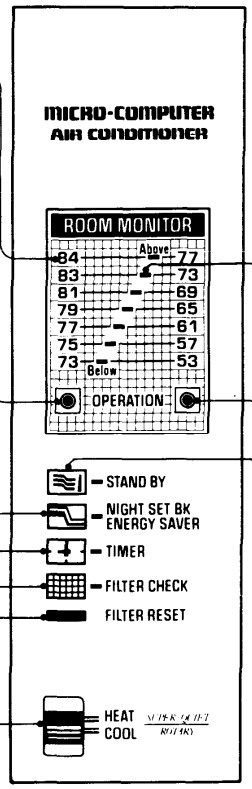
E. TEMPERATURE SENSOR
Electronically senses the room temperature and feeds data to the micro-computer.

F. OPERATION ON/OFF
This button starts and stops the air conditioner.

G. TEST RUN (Left side)
Set the lever to this position only when performing a test cooling operation (or a test heating opeation).

CAUTION:
Never leave the lever in this position. Otherwise, the *evaporator coil may freeze up in cooling (overload* condition of compressor may result in heating).

2. MONITOR PANEL



TEMPERATURE SCALE

COOLING OPERATION LAMP
This lamp is lit when the unit is operating in COOLING mode.

SAVING MODE LAMP
This lamp is lit when the unit is operating with the NIGHT SET BK (BACK) or the ENERGY SAVER Feature selected.

TIMER LAMP
This lamp is lit when the unit is operating with the TIMER on.

FILTER CHECK LAMP
When lamp is lit, the air filter must be cleaned. →See NOTE at right.

FILTER RESET BUTTON
When the FILTER RESET button is pressed, the FILTER CHECK lamp goes off. And begins to record usage time.

COOLING/HEATING SELECTOR
This is used to select either cooling or heating operation.

ROOM TEMPERATURE GUIDE LAMPS
These lamps indicate the approx. room temperature where the control unit is installed.

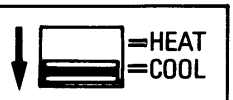
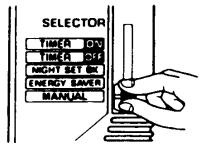
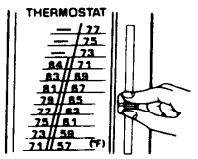
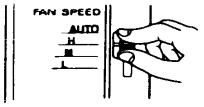
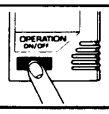
HEATING OPERATION LAMP
This lamp is lit when the unit is operating in HEATING mode.

STAND BY LAMP
This lights up in the following conditions:
1) At the start of heating (until heat exchanger coil becomes warm).
2) While the thermostat stops compressor in heating mode.
3) While the defrosting system is working.

NOTE:
- *When Power is supplied to the unit,* FILTER CHECK lamp is lit. After checking the condition of the filter, and cleaning it if needed, depress the FILTER RESET button.
- FILTER CHECK lamp is also lit when power is interrupted. To turn off the lamp, depress FILTER RESET button.

■ How to start air conditioner

(Manual cooling operation)

1	Set the COOLING/HEATING selector lever to "COOL" side.	
2	Set the SELECTOR lever to "MANUAL" position.	
3	Set the THERMOSTAT lever to the desired temperature.	
4	Set the FAN SPPED selector lever to either "AUTO", "High(H)", Medium(M)", or Low(L)" position.	
5	Depress the OPERATION button.	

■ How to stop

Depress the OPERATION button again to stop the air conditioner.

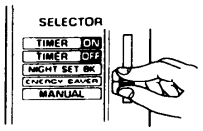
CAUTION:

When room temperature is lower than the set temperature, only the indoor fan will operate. If you want the unit to operate in the cooling mode, turn the thermostat lever towards the "71" direction.

When the operating button is depressed to start the unit, the outdoor unit will not start operating for three minutes to protect compressor from overloading. Thereafter, it will start operating normally.

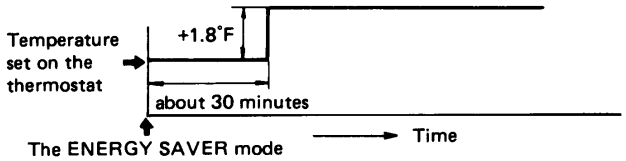
■ ENERGY SAVER operation

Set the SELECTOR lever to "ENERGY SAVER" position.



Next depress the OPERATION button.
(The ENERGY SAVER lamp and OPERATION lamp will light up.)

- In ENERGY SAVER mode, temperature setting on the thermostat is automatically maintained 1.8°F higher 30 minutes after starting the air conditioner. Room temperature is regulated to this setting, resulting in power saving. Relative confort is retained due to dehumidification.

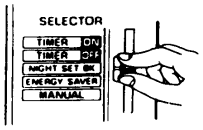


- When the room temperature reaches the preset temperature on the thermostat, both outdoor and indoor units stop simultaneously. This serves to prevent moisture around the indoor coil from blowing back into the room. At the same time, it saves electricity while the air conditioner is coming to a halt.

NOTE:
In both ENERGY SAVER and NIGHT SET BK modes, indoor fan stops 30 seconds after the compressor is shut down. At the start of compressor, indoor fan follows immediately.

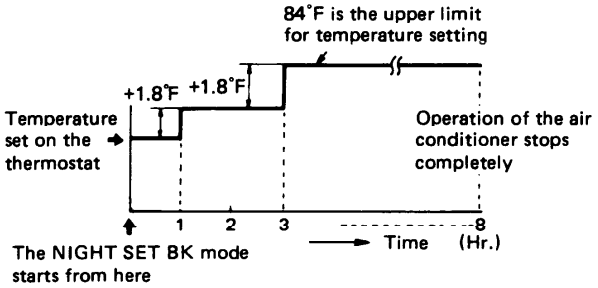
■ NIGHT SET BK operation

Set the SELECTOR lever to "NIGHT SET BK" position.



Next, depress the OPERATION button.
(The NIGHT SET BK lamp and OPERATION lamp will light up.)

- One hour after the NIGHT SET BK is put in operation, the temperature on the thermostat is raised 1.8°F from the initial set temperature, two hours later, it raises another 1.8°F. The air conditioner operates under this condition for eight hours. Then, the unit stops completely. This mechanism prevents room temperature from being reduced excessively and creates a comfortable condition for sleeping.



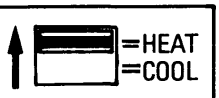
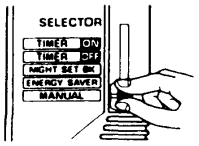
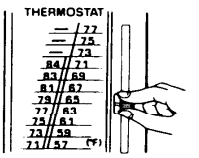
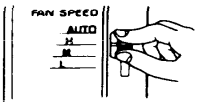
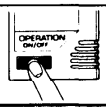
- Temperature setting must be reset for daytime use and unit turned on.

- In NIGHT SET BK mode, both outdoor and indoor units stop operation at preset temperature on the thermostat. This prevents room from increasing in humidity.

1

■ How to start air conditioner

(Manual heating operation)

1	Set the COOLING/HEATING selector lever to "HEAT" side.	
2	Set the SELECTOR lever to "MANUAL" position.	
3	Set the THERMOSTAT lever to the desired temperature.	
4	Set the FAN SPEED selector lever to either "AUTO", "High (H)", Medium (M)", position.	
5	Depress the OPERATION button.	

■ How to stop

Depress the OPERATION button again to stop the air conditioner.

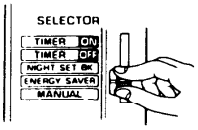
CAUTION:

When room temperature is higher than the set temperature, only the indoor fan will operate. If you want the unit to operate in the heating mode, turn the thermostat lever towards the "77" direction.

When the operation button is depressed to start the unit, the outdoor unit will not start operating for three minutes to protect compressor from overloading. Thereafter, it will start operating normally.

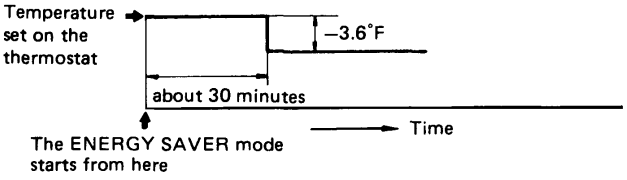
■ ENERGY SAVER operation

Set the SELECTOR lever to "ENERGY SAVER" position.



Next depress the OPERATION button.
(The ENERGY SAVER lamp and OPERATION lamp will light up.)

- In ENERGY SAVER mode, temperature setting on the thermostat is automatically maintained 3.6°F lower 30 minutes after starting the air conditioner. Room temperature is regulated to this setting, resulting in power saving.

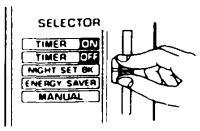


- When the room temperature reaches the preset temperature on the thermostat, both outdoor and indoor units stop simultaneously. At the same time, it saves electricity while the air conditioner is coming to a halt.

NOTE:
In both ENERGY SAVER and NIGHT SET BK modes, indoor fan stops 30 seconds after the compressor is shut down. At the start of compressor, indoor fan follows immediately.

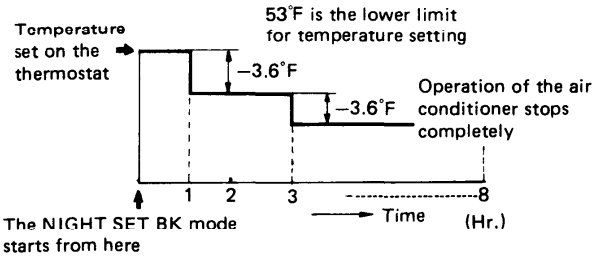
■ NIGHT SET BK operation

Set the SELECTOR lever to "NIGHT SET BK" position.



Next, depress the OPERATION button.
(The NIGHT SET BK lamp and OPERATION lamp will light up.)

- One hour after the NIGHT SET BK is put in operation, the temperature on the thermostat is fallen 3.6°F from the initial set temperature, two hours later, it falls another 3.6°F. The air conditioner operates under this condition for eight hours. Then, the unit stops completely. This mechanism prevents room temperature from being increased excessively and creates a comfortable condition for sleeping.



- Temperature setting must be reset for daytime use and unit turned on.

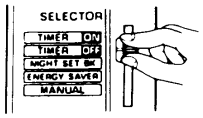
- In NIGHT SET BK mode, both outdoor and indoor units stop operation at preset temperature on the thermostat.

■ TIMER operation

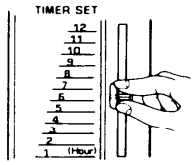
a. SET OFF mode

At the set time, operation will stop.

1. Set SELECTOR lever to the "TIMER OFF" position.



2. Set the TIMER SET lever to the desired time.
(When the timer is set at "6" as shown in the illustration at the right, the air conditioner will stop operation six hours later.)

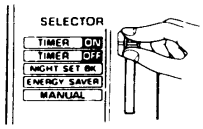


3. Depress the OPERATION button.
(The TIMER lamp and OPERATION lamp will light up.)

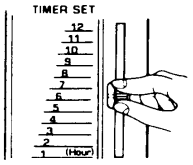
b. SET ON mode

At the set time, operation will start.

1. Set SELECTOR lever to the "TIMER ON" position.



2. Set the TIMER SET lever to the desired time.
(When the timer is set at "6" as shown in the illustration at the right, the air conditioner will start operation six hours later.)



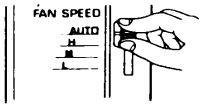
3. Depress the OPERATION button.
(Only the timer lamp will light up.)

1

■ FAN SPEED control

1. Automatic control of FAN SPEED

Set the FAN SPEED selector to "AUTO" position.



When fan speed is set at AUTO, the unit automatically decide the most suited fan speed by the room temperature and the setting of thermostat.
The relationship between temperature conditions and fan speed are as shown below:

COOLING

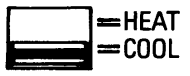
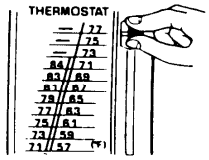
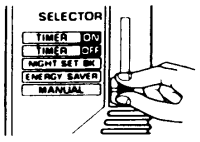
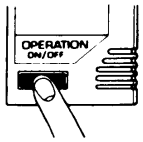
When difference between room temperature and set temperature is	FAN SPEED
3.6°F or over	High
Between 3.5 and 1.8°F	Medium
1.7°F or below	Low

HEATING

When difference between room temperature and set temperature is	FAN SPEED
1.6°F or over	High
Below 1.6°F	Medium

2. Manual control of FAN SPEED

(Fan only operation)

1	Set the COOLING/HEATING SELECTOR lever to "COOL" side. 
2	Set the THERMOSTAT lever at the extreme upward position. 
3	Set the SELECTOR lever to "MANUAL" position. 
4	Depress the OPERATION button. 

■ HEATING PERFORMANCE

- Because this air conditioner heats a room by drawing in the heat of the outside air (heat pump system), the heating efficiency will fall off as the outdoor temperature is reduced greatly. When sufficient heating is unavailable with this air conditioner, use other heating appliances in conjunction with this unit.

■ MICROCOMPUTER DEFROSTING (in heating)

- When the outdoor temperature is low, frost will be formed on the heat exchanger coil, reducing the heating performance. When this happens, a microcomputer defrosting system operates automatically and reverses the flow of warm refrigerant to the coil. At the same time the indoor fan stops its operation and the stand by lamp keeps glowing until completion of defrosting. Heating operation restarts automatically in several minutes. (Interval for recovery may vary with outdoor temperatures and condition of frost forming). This is the normal operating sequence.

■ WHEN STAND BY LAMP GLOWS

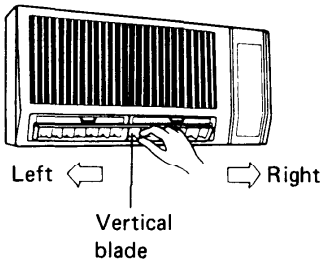
- For the initial several minutes after the start of heating operation, indoor fan will not start running until indoor heat exchanger coil is warmed up sufficiently. This is because COLD DRAFT PREVENTION SYSTEM is working. During this period STAND BY LAMP is kept glowing.
- STAND BY LAMP glows during defrosting and compressor is turned off with function of the thermostat in heating mode.
- Upon completion of the above conditions, STAND BY LAMP goes off automatically.

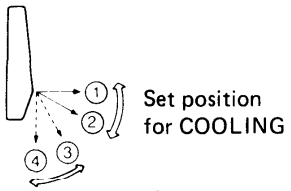
Air Flow Direction Adjustment

1. Adjustment in horizontal direction
The air flow can be regulated in the horizontal direction as follows:
Move the vertical blades with fingers in either left or right.

2. Adjustment in vertical direction
The air flow can be regulated in the vertical direction as follows:
Hold at both ends of the flap and move it up or down as required.

During cooling operation: be sure to set the flap at position for cooling.
During heating operation: be sure to set the flap at position for heating.



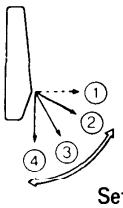


Set position for COOLING

Set position for FAN only

CAUTION

- If the flap is set at position "3" or "4", condensation may form near the air outlet grille and drip on the floor.
- We recommend that position "3" or "4" be used only when the air conditioner is operating in the FAN mode.



Set position for HEATING

CAUTION

Set flap position within the range ② to ④ for the effective heating.

4. INSTALLATION INSTRUCTIONS

SANYO

SAP91KC
SAP121KC
SAP90KCH

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2

1. GENERAL

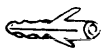
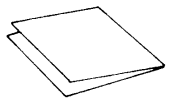
Here is a brief outline of where and how to install the unit. Please read over entire set of instructions for indoor and outdoor units and make sure all accessory parts listed are with the unit before beginning.

1-1. Tools Required for Installation (not supplied)

Drill, 3-5/32" dia. hole saw or key hole saw for normal walls. However, chisels or core bits will be required for brick, concrete, or similar walls.

- Common Screwdriver
- Phillips head screwdriver
- Knife or wire stripper
- Level
- Tape measure
- Pipe Cutter
- Pipe flaring tool
- Torque wrench
- Adjustable Wrench
- Reamer or Small File

1-2. Accessories Supplied with Unit for Installation

Parts	Figure	Q'ty	Parts	Figure	Q'ty
Anchor		10	Insul, Nipple		1
Cover	A (Indoor side) B (Outdoor side)	A : 1 B : 1	Cord Clip *		2
Tapping Screw	Truss HD phillips 4 x 16 mm(5/8")	6	Mounting * Bracket		1
Tapping * Screw	Flat HD phillips 3 x 10 mm (3/8")	2	Tapping * Screw	Pan HD phillips 4 x 16 mm (5/8")	2
Drain Hose		1	Full Scale Installation Diagram		1

* Parts for mounting control unit.

1-3. Optional Copper Tubing Kit

Copper tubing for connecting outdoor unit to indoor unit is available in kits which contain the narrow and wide tubing, fittings and insulation.

1-4. Type of Copper Tube and Insulation Material

If you wish to purchase these materials separately from a local source, you will need:

- Deoxidized annealed copper pipe 1/4" outside dia. with a 0.0314" wall thickness, and an equal length of 1/2" outside dia. with a 0.0314" wall thickness for model SAP121KC or 3/8" outside dia. with a 0.0314" wall thickness for models SAP91KC and SAP90KCH.

  Cut to the appropriate lengths + 12" to 20" on each to damper vibration between units.

- 2 Flare nuts for 1/4" O.D. pipe
- 2 Flare nuts for 1/2" O.D. pipe (SAP121KC)
- 2 Flare nuts for 3/8" O.D. pipe (SAP91KC) (SAP90KCH)

- Foamed, polyurethane or polyethylene installation 1/4" I.D., 3/8" I.D. or 1/2" I.D. as required to precise length of copper tubing, wall thickness of insulation should be 5/16" to 1/2" thick.
- Copper wire min. AWG 14 in appropriate length.

  Caution : Check local electrical codes before buying any wire, also any specific wiring instructions or limitation.
- 3" O.D. (I.D. 2-13/16", wall thickness 3/16") PVC pipe length to match thickness of wall.

1-5. Additional Materials Required to Give Installation a Professional Appearance

• Refrigeration (armored) tape	• Refrigeration Oil
• Insulated staples or clamps for connecting wire (see local codes)	• 3-1/2" clamp – use 1 every 4 ft. (To secure copper tubing).
• Putty (1/2 pt.)	

2. INSTALLATION SITE SELECTION

2

Indoor Unit :

AVOID:
- areas where leakage of flammable gas may be expected.
- places where large amounts of oil mist exist.
- direct sunlight.
- nearby heat sources that may affect performance of the unit.
- locations where remote control will be splashed with water or affected by dampness or humidity.
- installing remote control unit behind curtains or furniture that obstruct air circulation.

DO:
- select an appropriate position from which every corner of the room can be uniformly cooled. (High on the wall is best.)
- select a location that will hold the weight of the unit.
- select a location where piping and drain tube have shortest run to the outside. Fig. 1
- allow room for operation and maintenance as well as unrestricted air flow around the unit.
- install unit within 16'(SAP91KC & SAP90KCH), 23' (SAP121KC) up or down of outdoor unit and within a total of 33' from outdoor unit. Fig. 2.
- allow room for mounting control unit about 4' off the floor, in an area that is not in direct sunlight or in the flow of cool air from the unit.

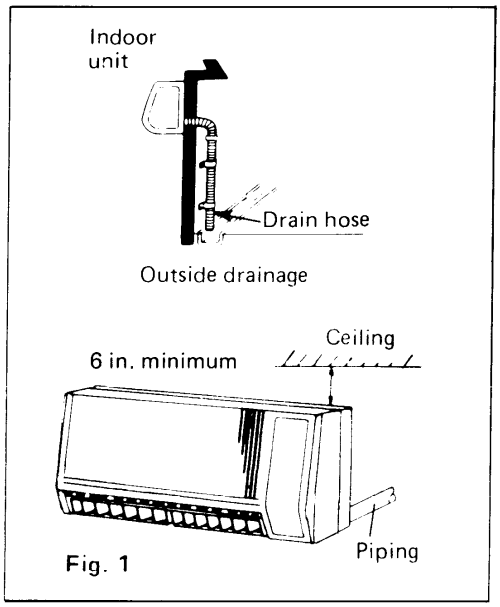


Fig. 1

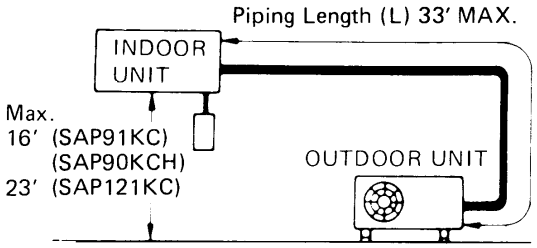


Fig. 2

Outdoor Unit :

AVOID:
- heat sources, exhaust fans, etc. Fig. 3
- direct sunlight.
- damp, humid or uneven locations.

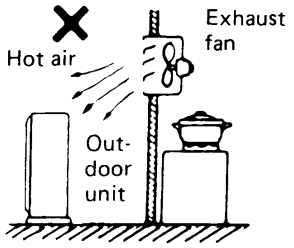


Fig. 3

DO:
- choose a place as cool as possible.
- choose a place that is well ventilated and outside air temperature does not exceed 113° F constantly.
- allow enough room around unit for air intake/exhaust and possible maintenance. Fig. 4
- provide a solid base; concrete (concrete block, 4 x 4 beams or equal), about 4" above ground level to reduce humidity and possible water damage in unit and decrease service life. Fig. 5
- use lag bolts or equal to bolt down unit, reducing vibration and noise.

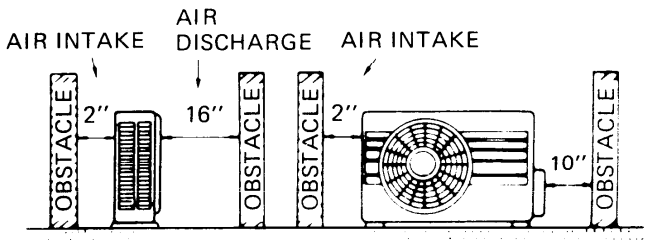


Fig. 4

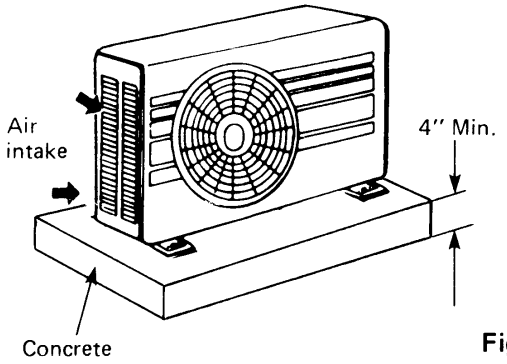


Fig. 5

3. HOW TO INSTALL INDOOR UNIT

3-1. Make a Hole

a) Tape full scale installation diagram on wall at location selected, make sure unit is horizontal, use a level or tape measure to measure down from ceiling. Fig. 6
(Use rear panel for measurement, if full scale installation diagram is not at hand.)

b) If tubing and wire are to go directly out back of unit on right side, use a hammer and a finishing nail (gypsum or paneled wall) to tap tiny holes in the plan where pipe cut out is indicated to make sure wooden studs or pipes are not directly behind area to be cut out.

CAUTION : also avoid areas directly over wall outlets as wiring could be going to outlet through the wall from the ceiling.

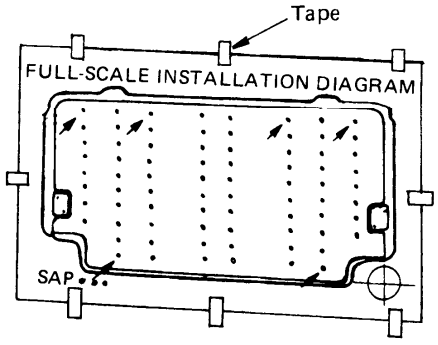


Fig. 6

Above precautions are also applicable if piping goes through wall in any other location.

c) Using the hammer and nail method across the diagram, you can find the studs in the wall (usually 16" apart) to assure a strong base for hanging the unit, put a pencil mark over the diagram at each stud location.

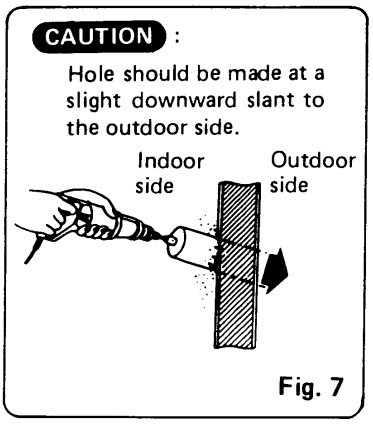


Fig. 7

d) Using a hole saw 3-5/32" dia. or key hole saw, cut a hole in inside wall. Fig. 7

e) Cut and move insulation in wall away from opening and drill a pilot hole 1/8" dia. at a slight downward angle through the outer wall, using the hole saw or key hole saw, cut a hole in the outer wall from the outside. (for concrete, brick plaster or similar type walls appropriate tools will have to be used.)

f) Measure thickness of wall from inside edge to outside edge and cut PVC pipe at a slight angle 1/4" shorter than the thickness of the wall. Fig. 8

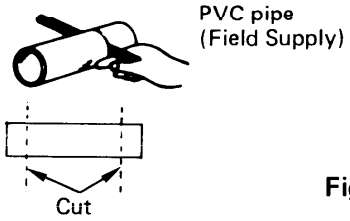


Fig. 8

g) Place plastic cover over end of pipe and insert in wall. Fig. 9

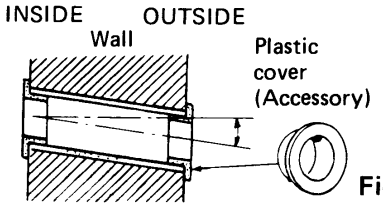


Fig. 9

2

3-2. Remove the Rear Panel from the Unit

Remove the two set screws (discard) and take off rear panel. Fig. 10

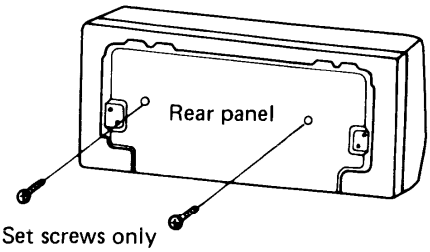


Fig. 10

3-3. Install the Rear panel (Panelled or gypsum walls)

a) Use diagram as a guide mount panel to the wall with screws provided. If you are not able to line up holes in rear panel with beam locations marked on wall, use toggle bolts or anchors to go thru holes on panel or drill 1/8" dia. holes in the panel over the stud locations and mount rear panel.

b) Double check with a ruler or level that panel is level. This is important to install the unit properly. Fig. 11

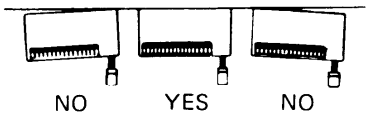


Fig. 11

c) Make sure panel is flush against wall. Any space between wall and unit will cause noise and vibration.

Block, brick, concrete or similar type walls
Make 3/16" dia. holes in the wall.

Insert anchors for appropriate mounting screws. Fig. 12

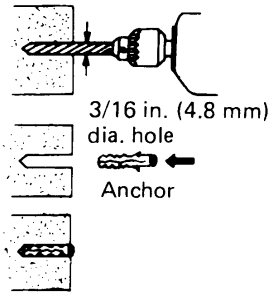


Fig. 12

3-4. Remove the Casing in order to Install the Indoor Unit

- **How to remove the casing**

a) Remove the two* set screws holding the casing to the indoor unit. (* SAP 121KC has three screws).

b) Pull up the casing by hand, press down on tabs on top, then withdraw the casing by pulling it back straight. Fig. 13

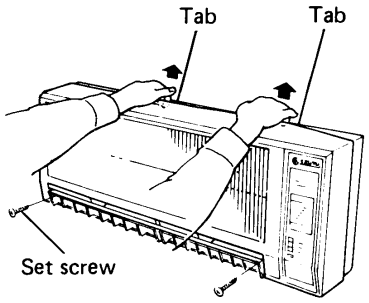


Fig. 13

3-5. Shape the Indoor Side Piping

a) Wrap armored tape around refrigerant piping and drain hose (just long enough to clear the outside wall).

b) Shape the refrigerant pipe so that it can easily go into the wall hole.

3-6. Wiring Instruction for Interunit Connections

a) Insert the interunit wiring (according to local codes) into throught-the-wall PVC pipe. Run the wiring toward indoor side allowing approx. 5 in. from the wall face. Fig. 14

CAUTION : Never fix the wiring by any means before the indoor unit is fully seated on the rear panel.

b) Unscrew the cover plate of the electrical component box. Then remove the bottom screw securing the electrical component box. Fig. 15

c) Insert the wrapped piping into the hole on the wall. Temporarily set the wiring connector in the hole at the electrical component box.

d) Hang the indoor unit on the rear panel. Fig. 16 (next page)

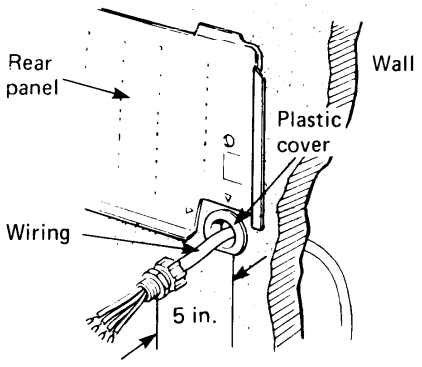


Fig. 14

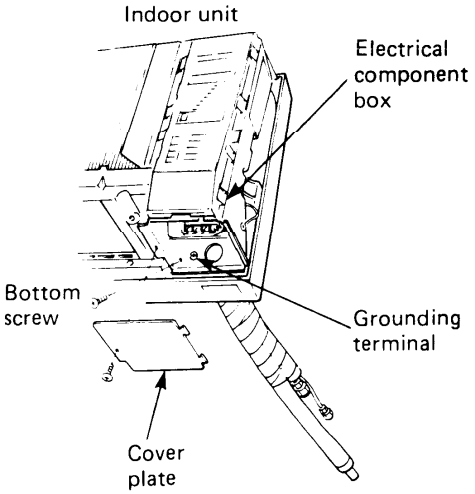


Fig. 15

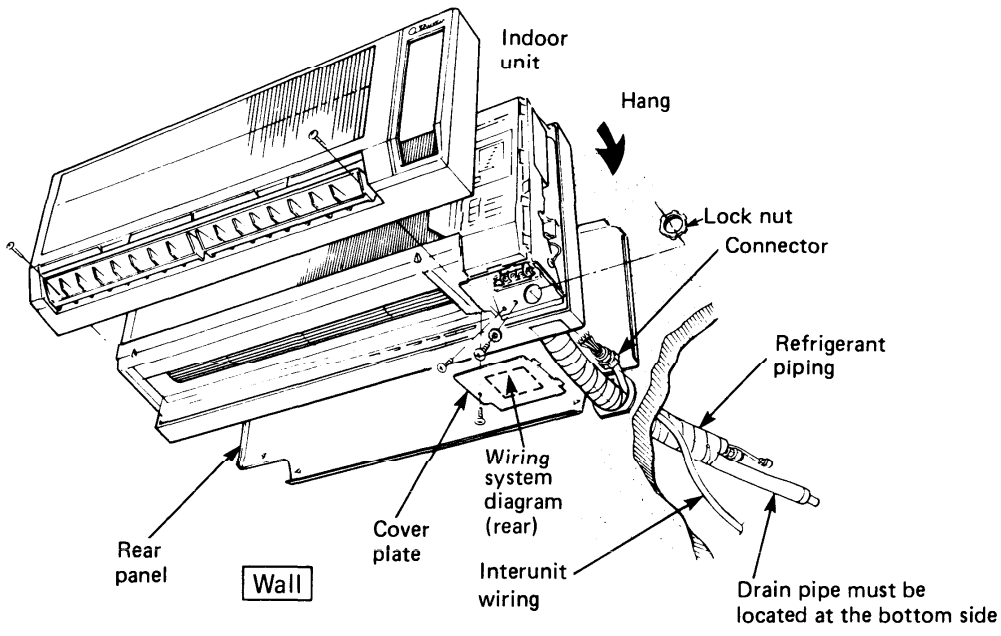


Fig. 16

2

e) Lift up the underside of the electrical component box slightly and secure the conduit connector to this box with a lock nut. Fig. 17

f) Give some play to the interunit wiring from the outdoor unit to the corresponding terminals on the terminal base.

CAUTION :

- Be sure to refer the wiring system diagram labelled on the cover plate (rear) and carry out correct field wiring. Wrong wiring causes malfunction of the unit.
- Check local electrical codes and also any specific wiring instructions or limitation.

g) Secure the electrical component box with the bottom screw. Then, reinstall the cover plate.

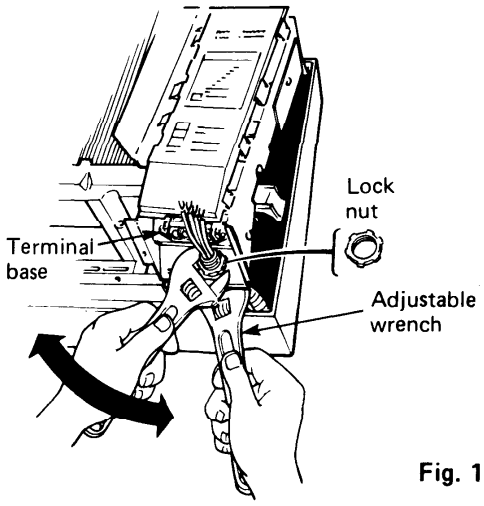


Fig. 17

3-7. Mounting

a) Push the flexible conduit, refrigerant piping and drain hose throught the hole in the wall. Adjust the indoor unit so it is securely seated on the rear panel.

b) Bend tubing (if reqd.) to run along wall in direction of outdoor unit then tape as far as the fittings. Drain hose should come straight down wall to a level where runoff won't stain wall.

3-8. Drain Piping

a) Drain piping should be slanted downward to outdoor. Fig. 18

b) Never form a trap in the course of piping.

c) If the drain pipe will run in the room, insulate the pipe with an insulation material* lest chilled sweat should damage furniture of floors. Fig. 19

* Formed polyurethane or polypropylene is recommended.

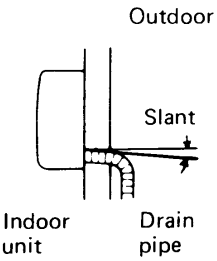
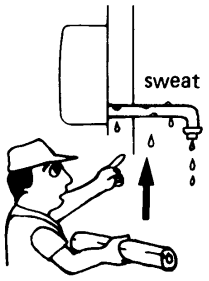


Fig. 18



Insulation material (field supply) must be applied.

Fig. 19

3-9. Install the Control Unit

Mounting position of control unit should be located in an accessible place for control and enable the average room temperature to be detected. Never cover over the unit or recess it into the wall.

a) Fix the mounting plate on the wall with 2 screws, align the rail on the rear of the control unit and slide the unit down as far as it will go. Fig. 20

b) Fix the control cord to the wall.

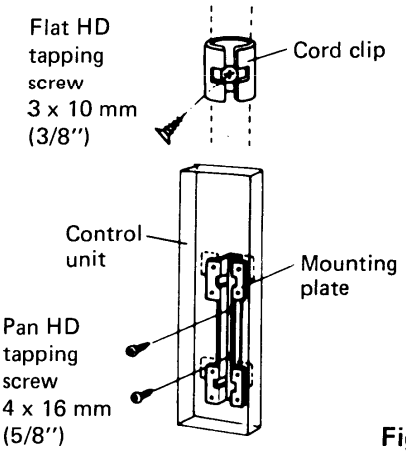


Fig. 20

3-10. WARNING

Do not supply power to the unit or operate until piping and wiring to the outside unit is completed.

4. HOW TO INSTALL OUTDOOR UNIT

- **Place unit on level concrete pad, blocks or equal and anchor.**

Refer to INSTALLATION SITE LOCATION given in page 3.

4-1. Wiring Instructions on Outdoor Unit

a) Remove access panel "C" and punch two knockout holes on the panel.

b) Connect interunit power line per drawing (Figs. 21A & 21B) labeled alongside of the panel "C".

c) Be sure to size each wire allowing serveral inches longer than the required length for wiring. Store wire strands inside the cabinet.

WIRING SYSTEM DIAGRAM SAP91KC SAP121KC

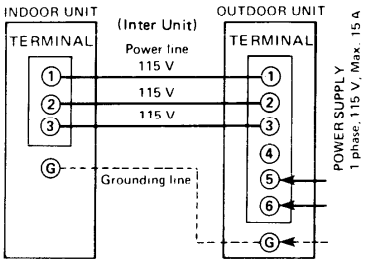


Fig. 21A

WIRING SYSTEM DIAGRAM SAP90KCH

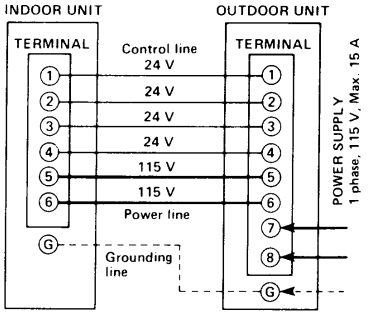


Fig. 21B

d) When connections are completed secure both connections on the panel with lock nuts and then close the panel. Fig. 22

e) Ground unit in accordance with local codes.

CAUTION :

- Be sure to comply with local codes on running the wire from the indoor unit to outdoor unit. (size of wire and wiring method etc.)
- Every wire must be connected firmly.
- No wire should touch refrigerant piping, compressor or any moving part.

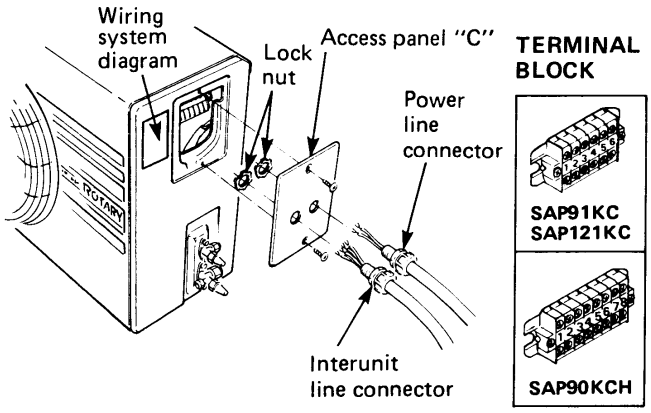


Fig. 22

5. REFRIGERANT PIPING

5-1. Use of the Flaring Method

The refrigerant piping for every split type air conditioner must be connected by flaring. In this method, the copper pipes are flared at each end and connected with flare nuts.

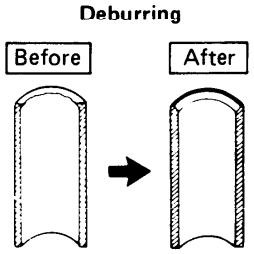


Fig. 23

5-2. Flaring procedure with a Flare Tool

a) Cut the copper pipe to proper length with a pipe cutter. It is recommended to cut approx. 12 ~ 20 in. longer than the estimated piping length.

b) Remove burrs at the end of the copper pipe with a pipe reamer or a file. This process is important and should be done carefully to make a good flare. Fig. 23

Note: When reaming, hold the pipe end downward and be sure that no copper scraps fall into the pipe. Fig. 24

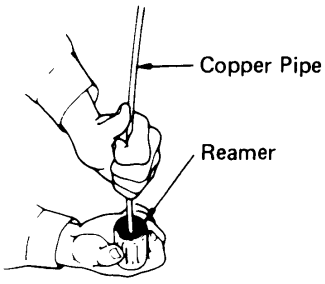


Fig. 24

c) Remove the flare nut from the unit and be sure to mount it on the copper pipe.

d) Make a flare at the end of copper pipe with a flare tool* Fig. 25 (*Use "RIGID" or equivalent.)

Note: Good flare should have following conditions:

- Inside surface is glossy and smooth.
- Edge is smooth.
- Tapered sides are in uniform length.

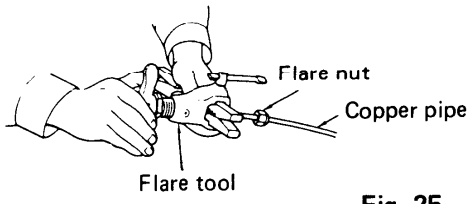


Fig. 25

5-3. Caution before connecting pipes tightly

a) Be sure to apply blind cap or water proof tape to prevent dust or water from getting into the pipe, until it is used.

b) Be sure to apply refrigeration oil to the matching surfaces of flare and union before connecting them together. This is effective for reducing gas leaks. Fig. 26

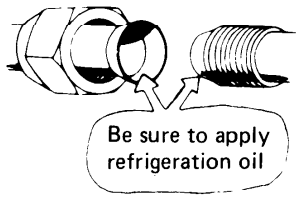


Fig. 26

c) For proper connection, hold union pipe and flare pipe straight with each other, screw in the flare unit lightly at first to obtain smooth match. Fig. 27

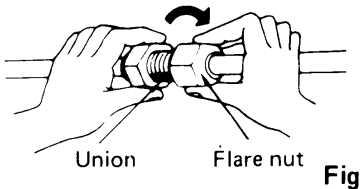


Fig. 27

5-4. Connecting Pipes between Indoor and Outdoor Units

1. Connect the indoor side refrigerant piping extended from the wall with the outdoor side piping tightly.

2. Flare nut on large dia. pipe should be torqued to 430 ~ 470 lbs. in. (SAP 121KC) or 300 ~ 340 lb. in (SAP 91KC). Flare nut small dia. pipe should be torqued to 130 ~ 170 lbs. in. Fig. 28

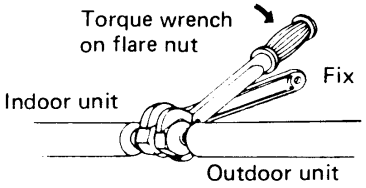


Fig. 28

3. After performing a leak test on the connecting part, insulate it with INSUL. NIPPLE and finish with a vinyl masking tape over it. Fig. 29

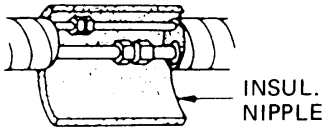


Fig. 29

5-5. Insulation of Refrigerant Pipes

Because the capillary tubing is installed in the outdoor unit, both wide and narrow pipes of this air conditioner become cold. Therefore, to prevent heat loss and wet floors due to dripping of chilled sweat, both pipes must be well insulated with proper insulation material. Thickness of insulation material should be min. 5/16". Fig. 30

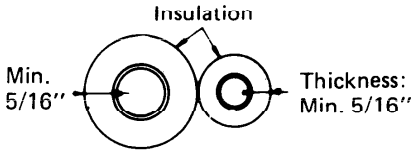


Fig. 30

- **Insulation material**

The material must of course have good insulation characteristics, be easy to use, age resistant, and must not easily absorb moisture. The following is recommended; foamed polyurethane or polypropylene.

5-6. Taping the Pipes

a) At this time, the two pipes, (and electrical wire if code permits) should be taped together with armoring tape. The drain pipe may also be included and taped together as one bundle with the piping.

b) Wrap the armoring tape from the bottom of the outdoor unit to the top of the piping, where it enters the wall. As you wrap the piping cover half of each previous tape turn. Fig. 31

c) Clamp piping bundle to wall, one clamp every 4' approx.

NOTE: Do not wind the armoring tape around too tightly since this will impair the heat insulation effect. Also be sure condensation drain hose splits away from bundle and empties clear of unit and piping.

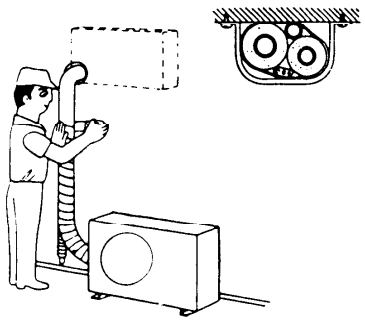


Fig. 31

5-7. Finishing the Installation

After finishing insulation and taping over piping, fill the void space with putty to prevent rain and draft from entering. Fig. 32

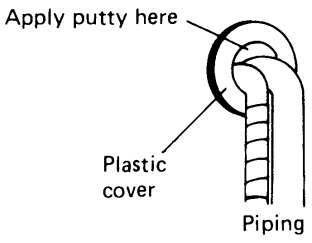


Fig. 32

6. AIR PURGING

Air does not function as a refrigerant, because it cannot be liquefied in the condenser. Air and moisture remaining in the refrigerant system have undesirable effects as indicated at right. Therefore, they must be purged completely.

- The pressure on the narrow pipe rises.
- The operating current rises.
- Cooling and heating efficiency drops.
- Water contained in the air may freeze and block the capillary tubing.
- Water may lead to corrosion of parts in the refrigerant circuit.

6-1. Piping Diagram for Air Purging

SAP 91KC
(Model: SAP 121KC)

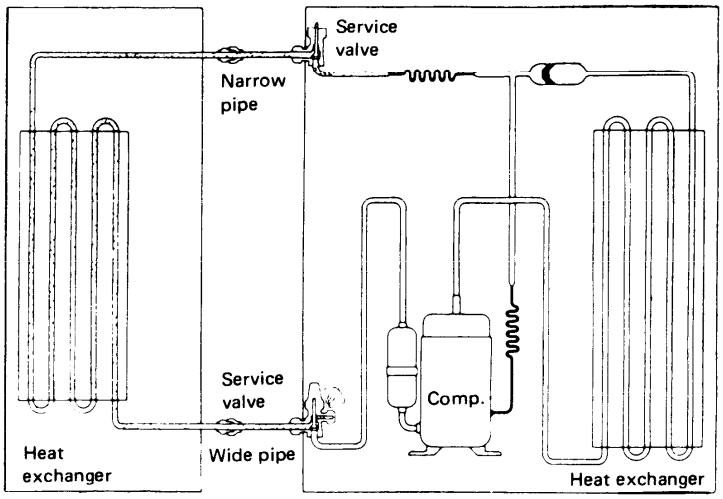


Fig. 33

(Model: SAP 90KCH)

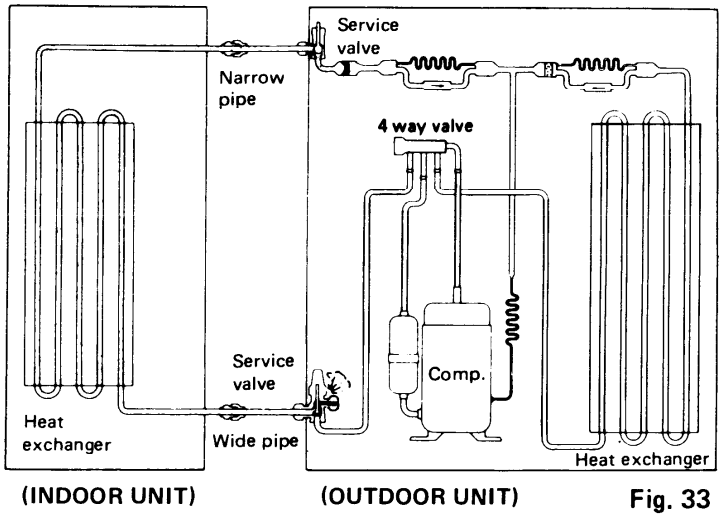


Fig. 33

6-2. Quick Air Purge System

New quick air purge system represents purging the air in the indoor unit and connection pipes with the aid of refrigerant gas pre-charged in the outdoor unit.
Be this system, air purging has become much simpler and installation time has become shorter than conventional methods.

* Interval required for air purging is only 15 seconds.

NOTE: Compressor is pre-charged at the factory ont to open valves until piping is hooked up and you are ready to proceed with purging procedure.

2

6-3. Air Purging Procedure

a) Remove the valve caps from the service valves on the narrow and wide pipe.
b) Slacken off the flare nut at the charging port one full turn. Fig. 34
c) Open the service valve on the narrow pipe side by 90 degrees (1/4 turn).
(During this operation, air will be discharged from the charging port of the service valve on the wide pipe.)
d) 15 seconds after opening the spindle, tighten up the flare nut of the charging port.
e) Shut the spindle of the service valve on the narrow pipe. Fig. 35
f) Leak test the joints with liquid soap. Fig. 36
g) Fully open the spindles of the service valves on the wide pipe and the narrow pipe.
h) Next, re-install the valve caps in which copper gaskets have been inserted. Fig. 37
i) The air purge procedure has been completed and the unit is ready for trail operation.

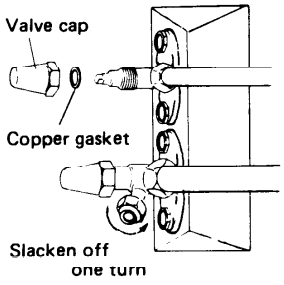


Fig. 34

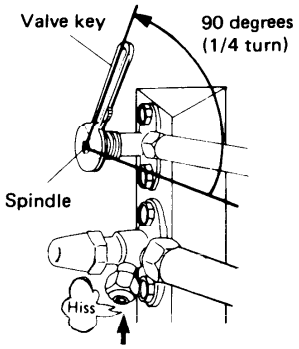


Fig. 35

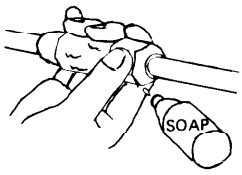


Fig. 36

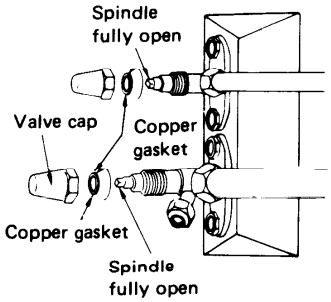


Fig. 37

7. TRIAL RUN

Check that all piping and wiring have been completed correctly. Check again that wide and narrow pipe service valves are fully opened. Turn on power and run the unit.

■ SERVICE VALVE CONSTRUCTION

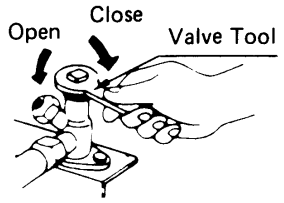
- **Valve Position -a-**
  The valve stems of both wide & narrow pipes are turned all the way in. The unit is shipped from the factory in this position and it is also used for PUMP DOWN. (Fig. 38-a)

- **Valve Position -b-**
  The valve stems of both wide & narrow pipes are turned all the way out ("BACK SEAT" position). This is the normal operating position. (Fig. 38-b)

- **Valve Position -c-**
  With the narrow pipe valve kept at BACK SEAT, only the wide pipe valve stem is turned halfway-down position. This position is used for pressure measurement and gas charging. (Fig. 38-c)

- **Valve Position -d-**
  Like position -a-, but with the flare nut of wide pipe open. This position is used for air purging. (Fig. 38-d)

CAUTION :
Be sure to use the valve tool or ratchet wrench when opening or closing the shut-off valve spindle.



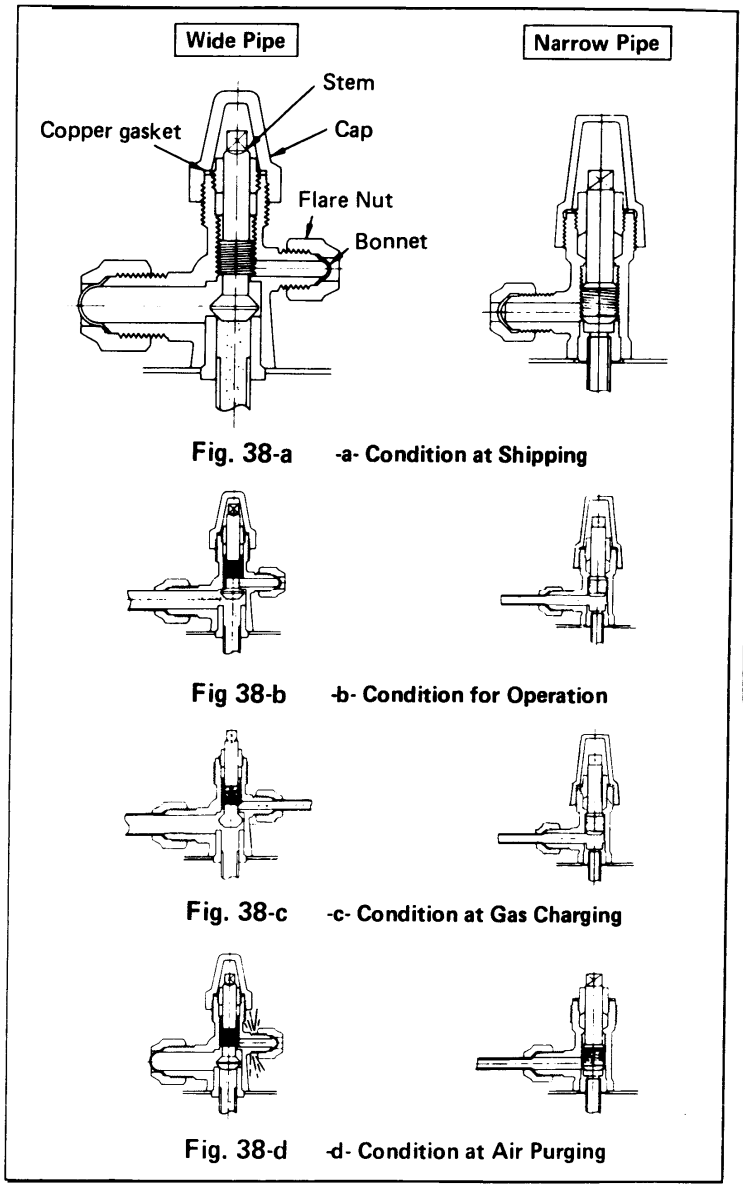


Fig. 38-a -a- Condition at Shipping

Fig 38-b -b- Condition for Operation

Fig. 38-c -c- Condition at Gas Charging

Fig. 38-d -d- Condition at Air Purging

■ PUMP DOWN

Pump down means collecting all refrigerant in the system back into the outdoor unit without losing refrigerant gas. Pump down is used when unit is moved or for servicing the refrigerant circuit.

CAUTION : **SAP90KCH only**
Set the COOLING/HEATING selector lever to the 'COOL' side and operate in cooling mode.

1) Close valve on wide pipe halfway (2 turns).
2) Close valve on narrow pipe all the way (4 turns).
3) Turn unit on (cooling) for approximately 3 minutes then shut off.
4) Close valve on wide pipe all the way (2 additional turns).
5) Disconnect pipes slowly allowing pressure to equalize inside and out.
6) When piping is disconnected provide dust covers for both valves and pipes until unit is reconnected.

5. TROUBLE SHOOTING

— Quick Access Index —

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(SAP90KCH) ..... 39 – 52

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1.1.2. Circuit breaker trips when the operation switch is depressed
1.2. Neither indoor unit or outdoor unit runs

2. Some part of air conditioner does not operate 42 47
2.1. Indoor fan does not run
2.2. Neither outdoor fan or compressor run
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2.4. Only compressor does not run
2.5. Compressor frequently repeats ON and OFF

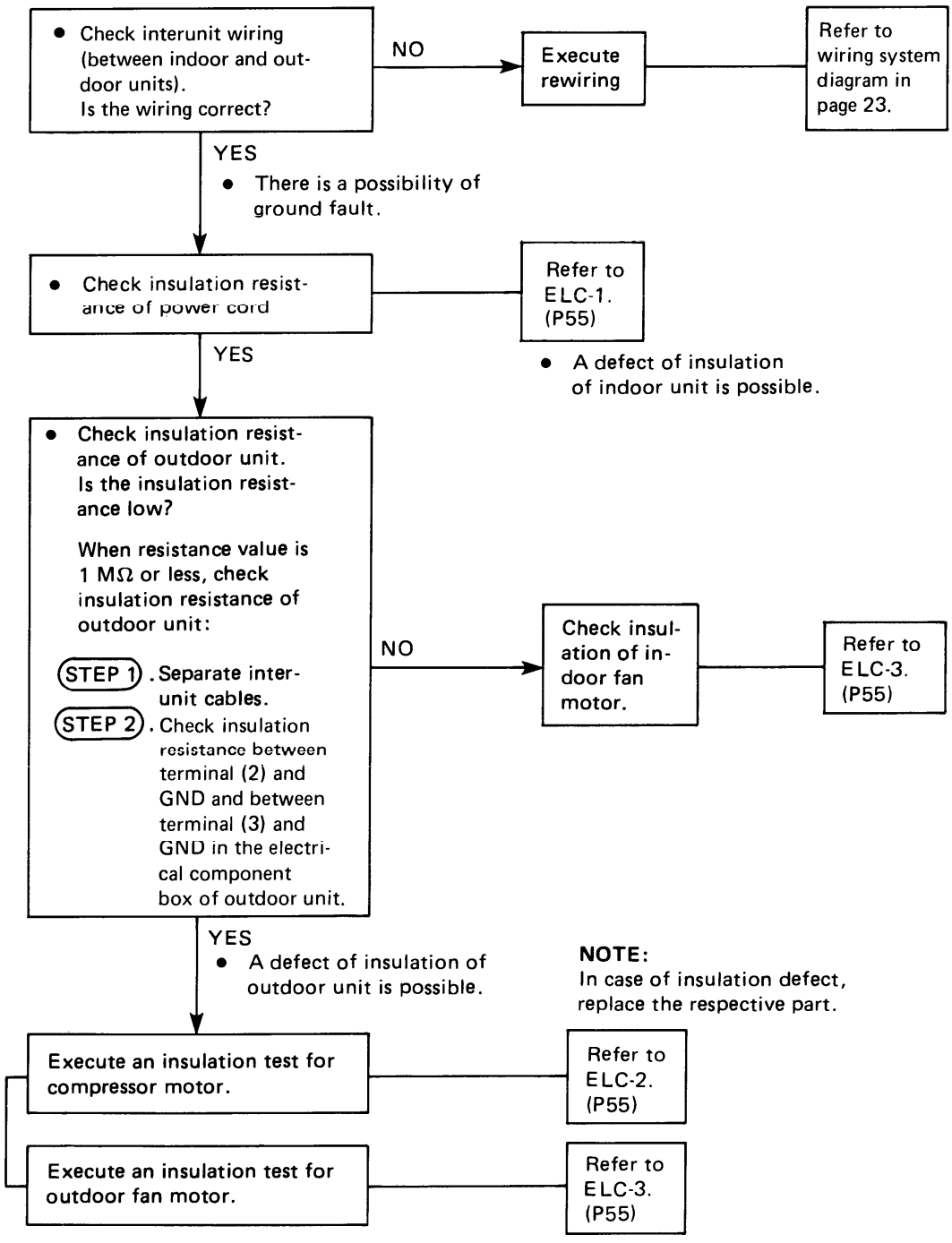
3. Air conditioner operates, but abnormalities are observed ..... 48 & 49
3.1. Poor cooling (or heating)
3.2. Excessive cooling

4. Respective Operation Modes at the Time of Heating ..... 50 – 52

1. Air conditioner does not operate

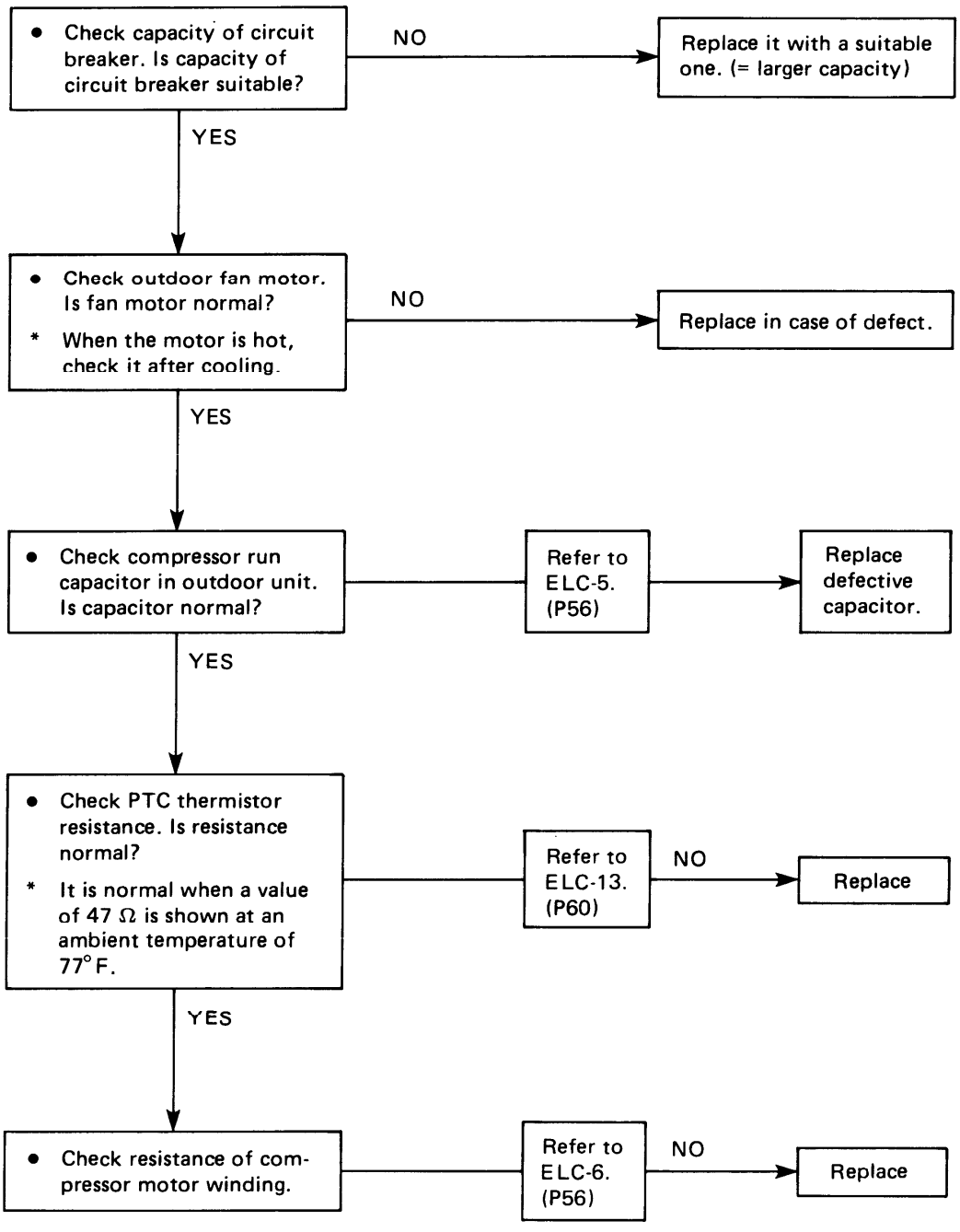
1.1 Circuit breaker trips (or fuse blows)

1.1.1 When circuit breaker is set to ON, it trips soon (resetting is not possible)

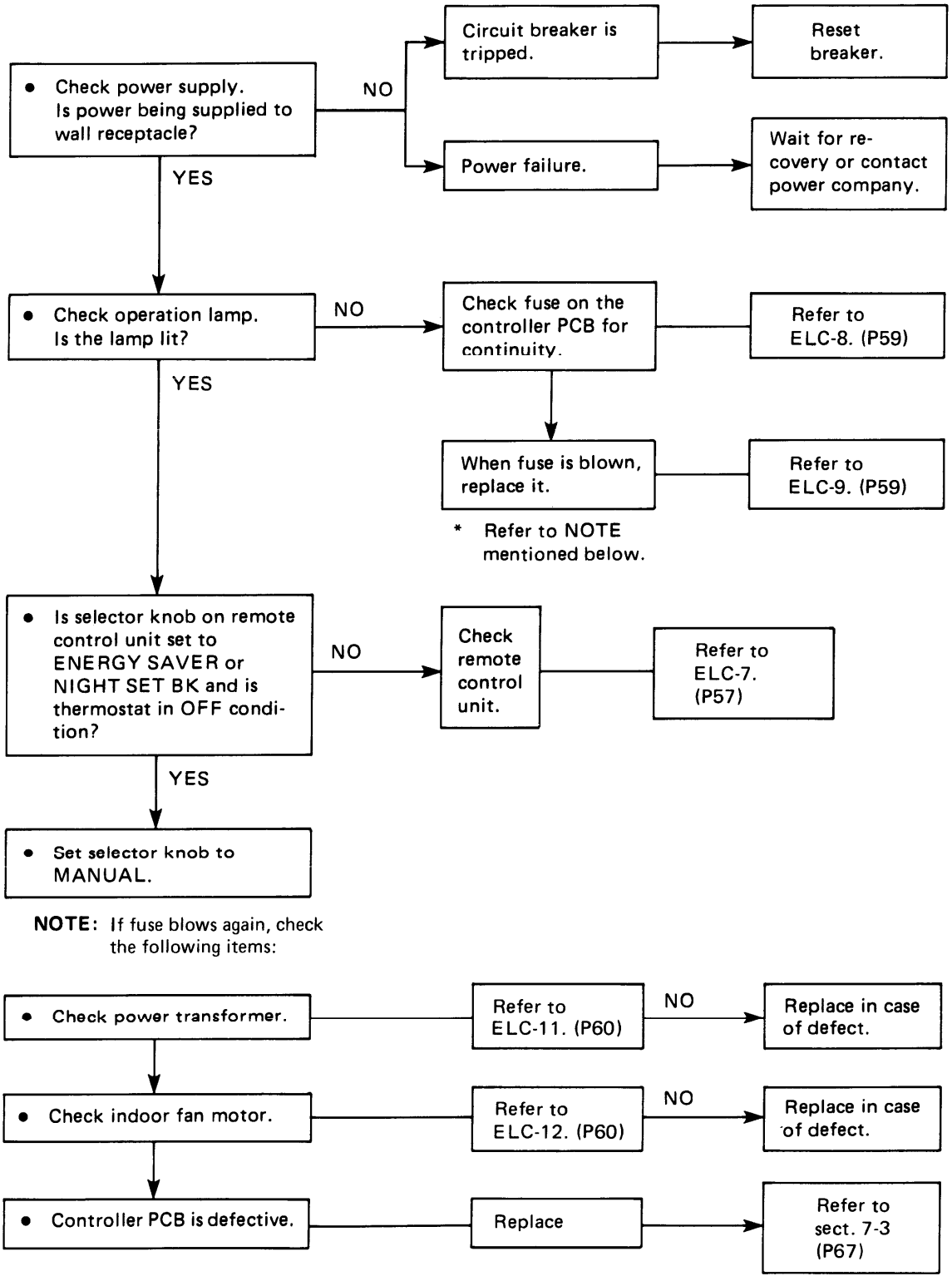

• Check interunit wiring (between indoor and outdoor units). Is the wiring correct?
NO
Execute rewiring
Refer to wiring system diagram in page 23.
YES
• There is a possibility of ground fault.
• Check insulation resistance of power cord
Refer to ELC-1. (P55)
YES
• A defect of insulation of indoor unit is possible.
• Check insulation resistance of outdoor unit. Is the insulation resistance low?
When resistance value is 1 MΩ or less, check insulation resistance of outdoor unit:
STEP 1. Separate interunit cables.
STEP 2. Check insulation resistance between terminal (2) and GND and between terminal (3) and GND in the electrical component box of outdoor unit.
NO
Check insulation of indoor fan motor.
Refer to ELC-3. (P55)
YES
• A defect of insulation of outdoor unit is possible.
NOTE:
In case of insulation defect, replace the respective part.
Execute an insulation test for compressor motor.
Refer to ELC-2. (P55)
Execute an insulation test for outdoor fan motor.
Refer to ELC-3. (P55)

3

1.1.2 Circuit breaker trips when the operation switch is depressed.


• Check capacity of circuit breaker. Is capacity of circuit breaker suitable?
NO
Replace it with a suitable one. (= larger capacity)
YES
• Check outdoor fan motor. Is fan motor normal?
* When the motor is hot, check it after cooling.
NO
Replace in case of defect.
YES
• Check compressor run capacitor in outdoor unit. Is capacitor normal?
Refer to ELC-5. (P56)
Replace defective capacitor.
YES
• Check PTC thermistor resistance. Is resistance normal?
* It is normal when a value of 47 Ω is shown at an ambient temperature of 77° F.
Refer to ELC-13. (P60)
NO
Replace
YES
• Check resistance of compressor motor winding.
Refer to ELC-6. (P56)
NO
Replace

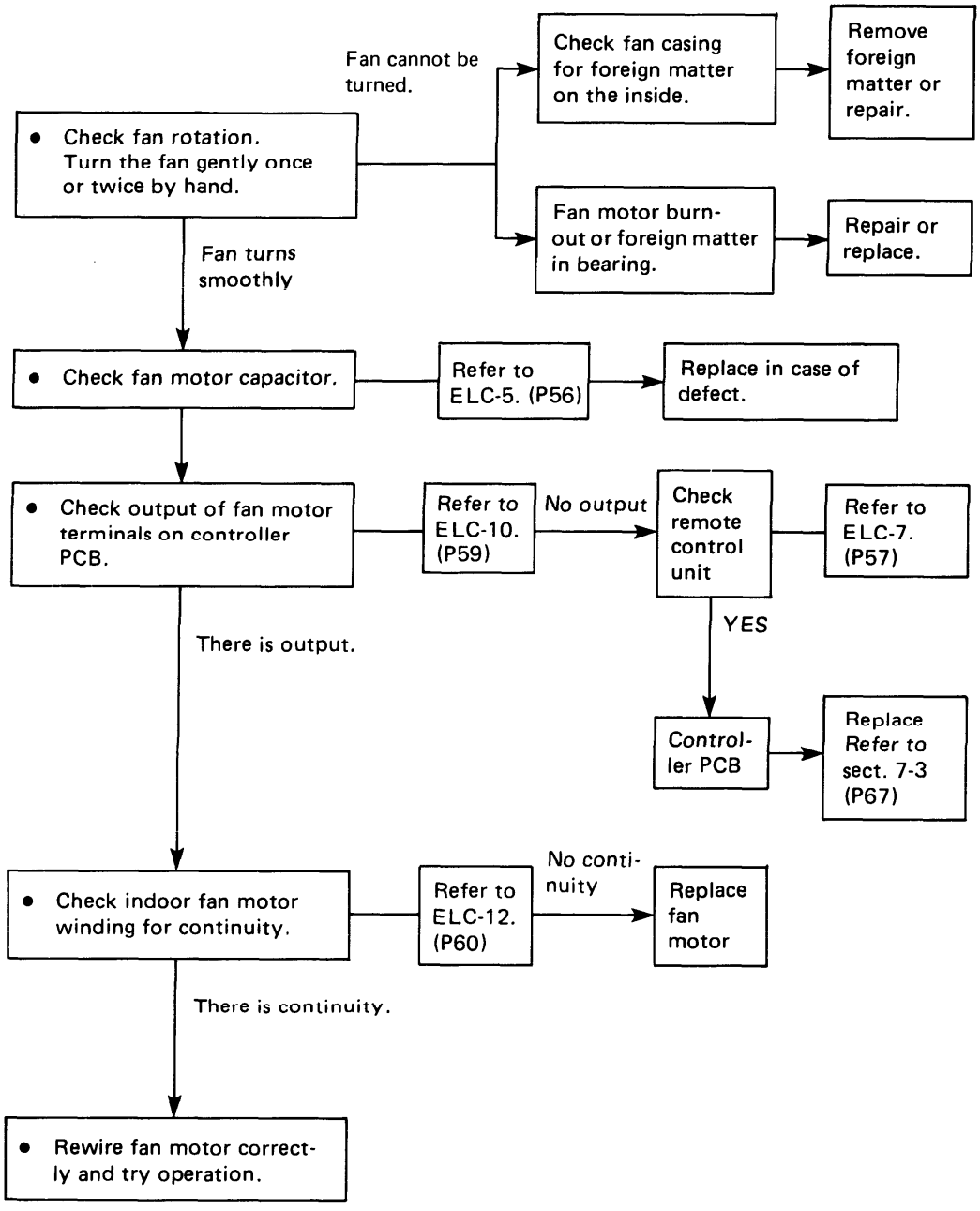
1.2 Neither indoor unit nor outdoor unit run


• Check power supply. Is power being supplied to wall receptacle?
NO
Circuit breaker is tripped.
Reset breaker.
Power failure.
Wait for recovery or contact power company.
YES
• Check operation lamp. Is the lamp lit?
NO
Check fuse on the controller PCB for continuity.
Refer to ELC-8. (P59)
YES
When fuse is blown, replace it.
Refer to ELC-9. (P59)
* Refer to NOTE mentioned below.
• Is selector knob on remote control unit set to ENERGY SAVER or NIGHT SET BK and is thermostat in OFF condition?
NO
Check remote control unit.
Refer to ELC-7. (P57)
YES
• Set selector knob to MANUAL.
NOTE: If fuse blows again, check the following items:
• Check power transformer.
Refer to ELC-11. (P60)
NO
Replace in case of defect.
• Check indoor fan motor.
Refer to ELC-12. (P60)
NO
Replace in case of defect.
• Controller PCB is defective.
Replace
Refer to sect. 7-3 (P67)

3

2. Some part of air conditioner does not operate

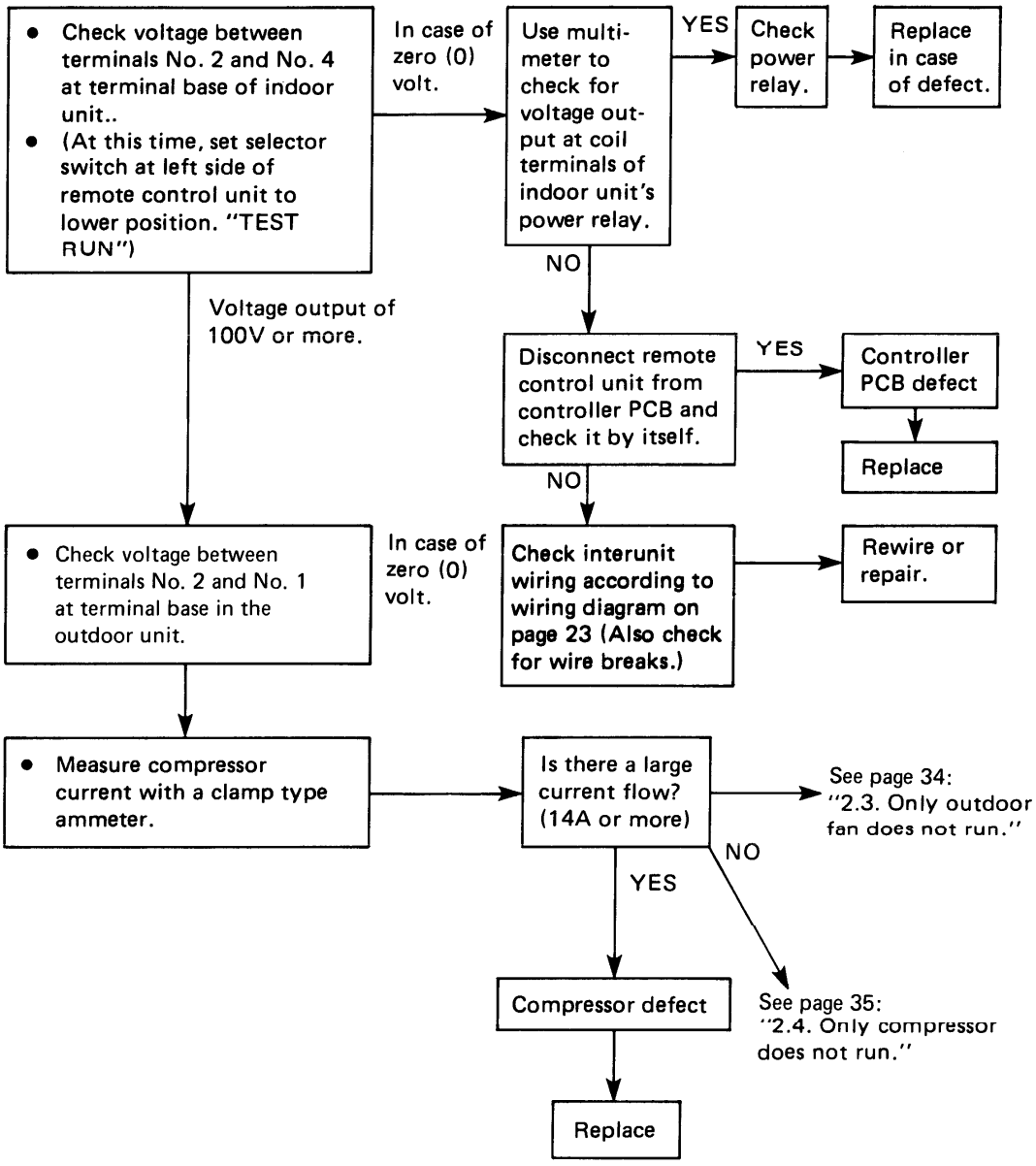
2.1 Indoor fan does not run


Fan cannot be turned.
Check fan casing for foreign matter on the inside.
Remove foreign matter or repair.
• Check fan rotation. Turn the fan gently once or twice by hand.
Fan motor burn-out or foreign matter in bearing.
Repair or replace.
Fan turns smoothly
• Check fan motor capacitor.
Refer to ELC-5. (P56)
Replace in case of defect.
• Check output of fan motor terminals on controller PCB.
Refer to ELC-10. (P59)
No output
Check remote control unit
Refer to ELC-7. (P57)
There is output.
YES
Control-ler PCB
Replace Refer to sect. 7-3 (P67)
No conti-nuity
• Check indoor fan motor winding for continuity.
Refer to ELC-12. (P60)
Replace fan motor
There is continuity.
• Rewire fan motor correct-ly and try operation.

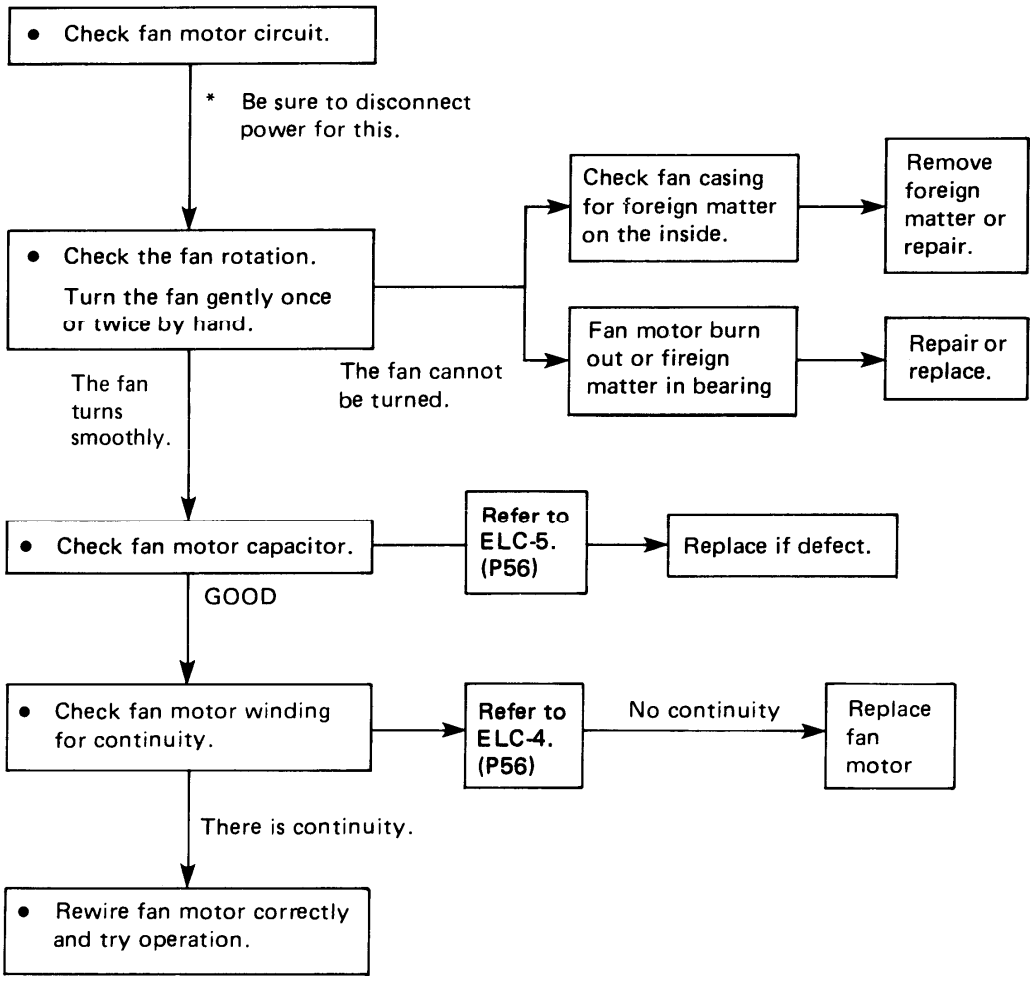
2.2 Neither outdoor fan nor compressor do not run

Note: Check following points at first;

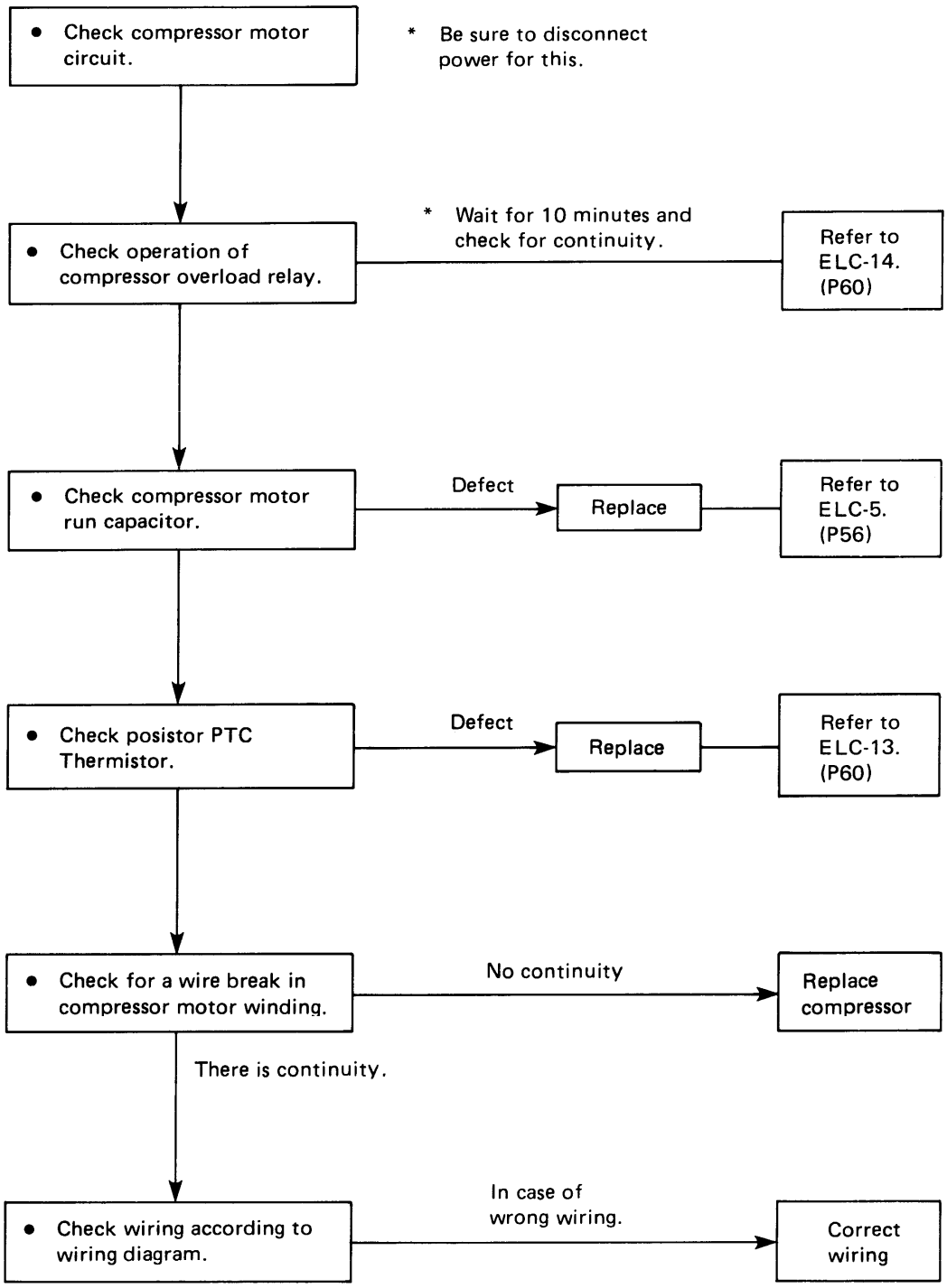
1. Is thermostat setting suitable?
2. Has 3 minute timer operated?
   (No operation for 3 minutes after power ON.)


• Check voltage between terminals No. 2 and No. 4 at terminal base of indoor unit..
• (At this time, set selector switch at left side of remote control unit to lower position. "TEST RUN")
In case of zero (0) volt.
Use multi-meter to check for voltage output at coil terminals of indoor unit's power relay.
YES
Check power relay.
Replace in case of defect.
NO
Voltage output of 100V or more.
Disconnect remote control unit from controller PCB and check it by itself.
YES
Controller PCB defect
Replace
NO
• Check voltage between terminals No. 2 and No. 1 at terminal base in the outdoor unit.
In case of zero (0) volt.
Check interunit wiring according to wiring diagram on page 23 (Also check for wire breaks.)
Rewire or repair.
• Measure compressor current with a clamp type ammeter.
Is there a large current flow? (14A or more)
See page 34: "2.3. Only outdoor fan does not run."
NO
YES
Compressor defect
See page 35: "2.4. Only compressor does not run."
Replace

2.3 Only outdoor fan does not run

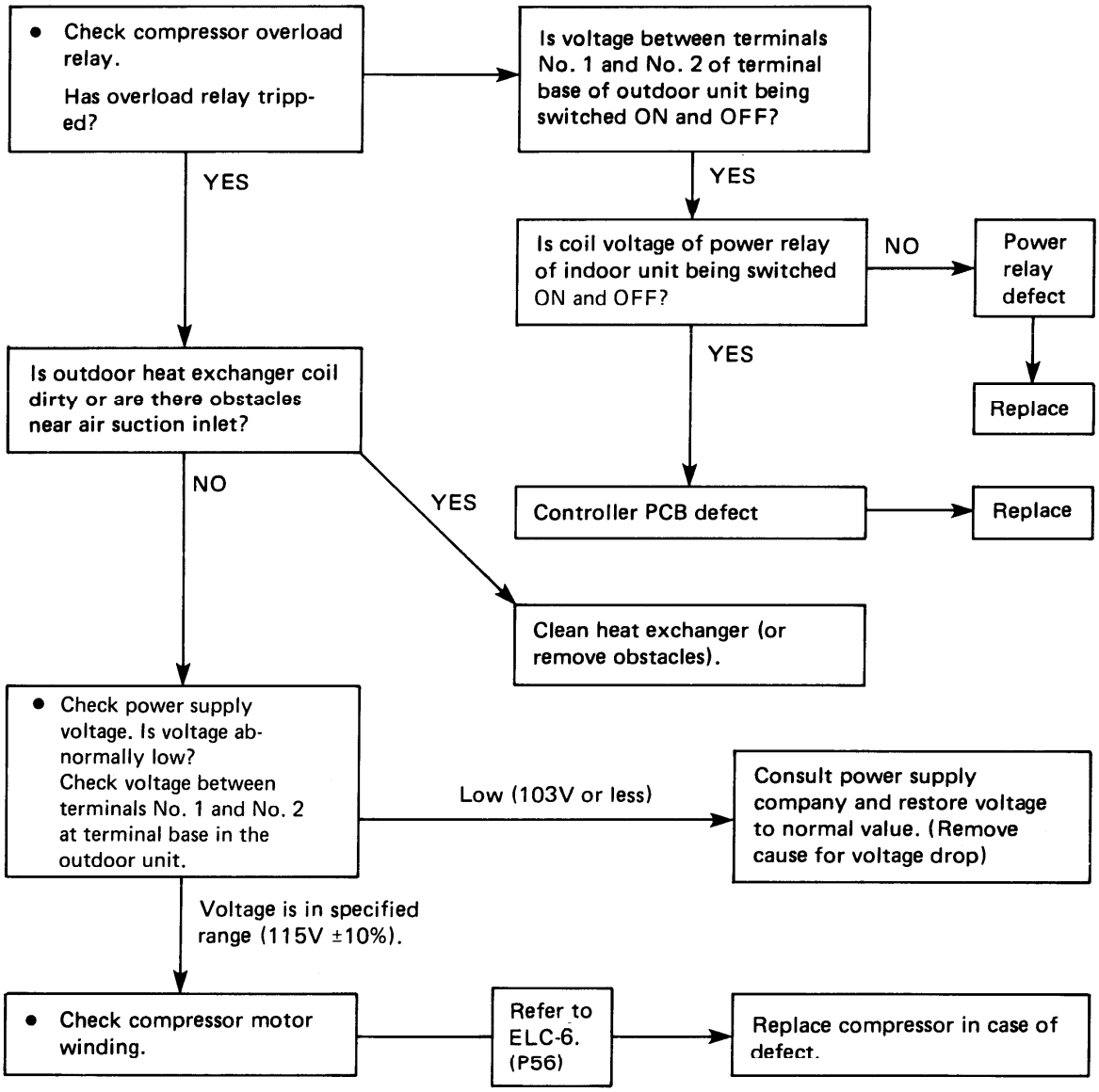

• Check fan motor circuit.
* Be sure to disconnect power for this.
• Check the fan rotation.
Turn the fan gently once or twice by hand.
Check fan casing for foreign matter on the inside.
Remove foreign matter or repair.
The fan cannot be turned.
Fan motor burn out or fireign matter in bearing
Repair or replace.
The fan turns smoothly.
• Check fan motor capacitor.
Refer to ELC-5. (P56)
Replace if defect.
GOOD
• Check fan motor winding for continuity.
Refer to ELC-4. (P56)
No continuity
Replace fan motor
There is continuity.
• Rewire fan motor correctly and try operation.

2.4 Only compressor does not run


• Check compressor motor circuit.
* Be sure to disconnect power for this.
• Check operation of compressor overload relay.
* Wait for 10 minutes and check for continuity.
Refer to ELC-14. (P60)
• Check compressor motor run capacitor.
Defect
Replace
Refer to ELC-5. (P56)
• Check posistor PTC Thermistor.
Defect
Replace
Refer to ELC-13. (P60)
• Check for a wire break in compressor motor winding.
No continuity
Replace compressor
There is continuity.
• Check wiring according to wiring diagram.
In case of wrong wiring.
Correct wiring

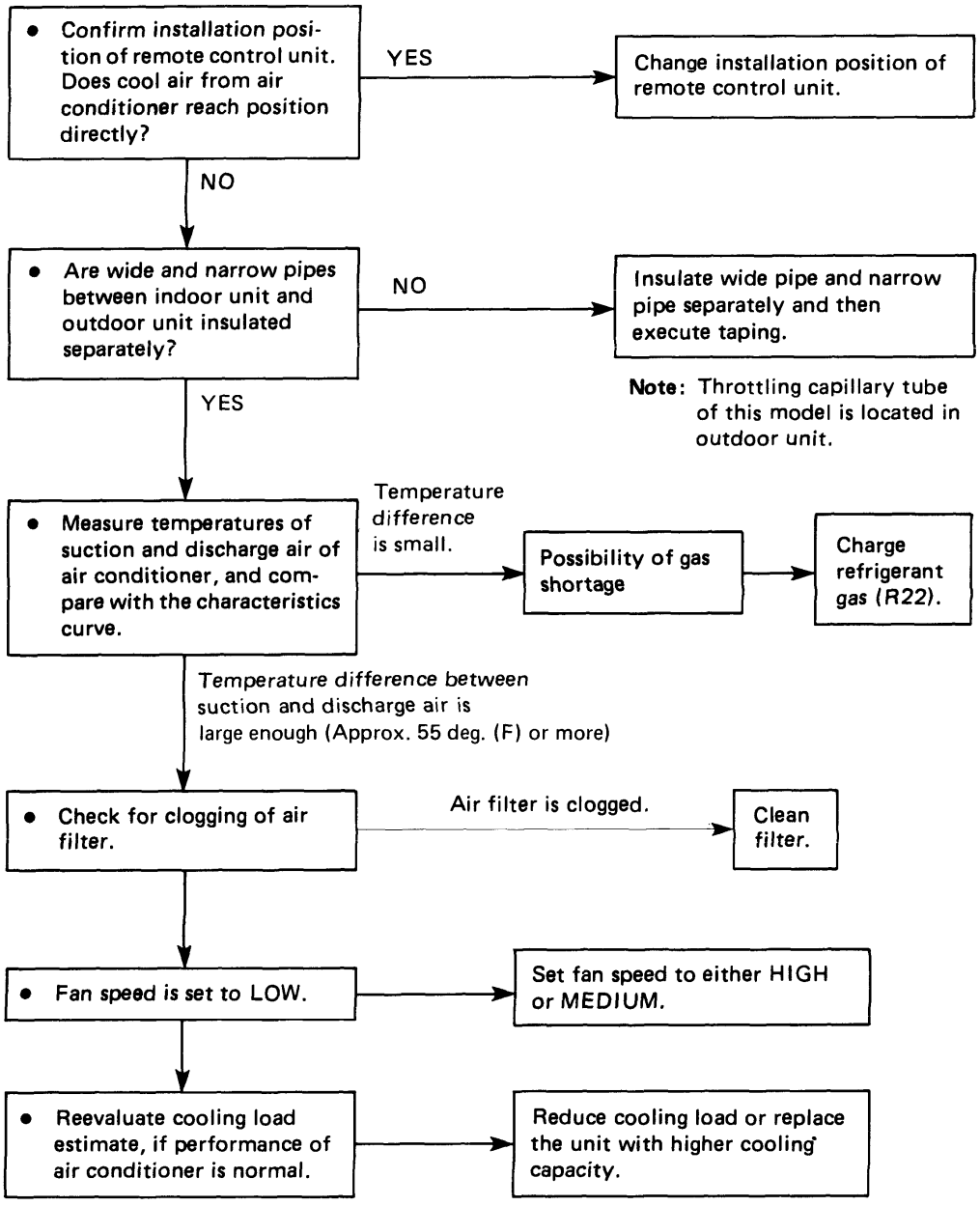
2.5 Compressor frequently repeats ON and OFF

(Only compressor repeats ON and OFF, while indoor unit and outdoor fan run without fall.)

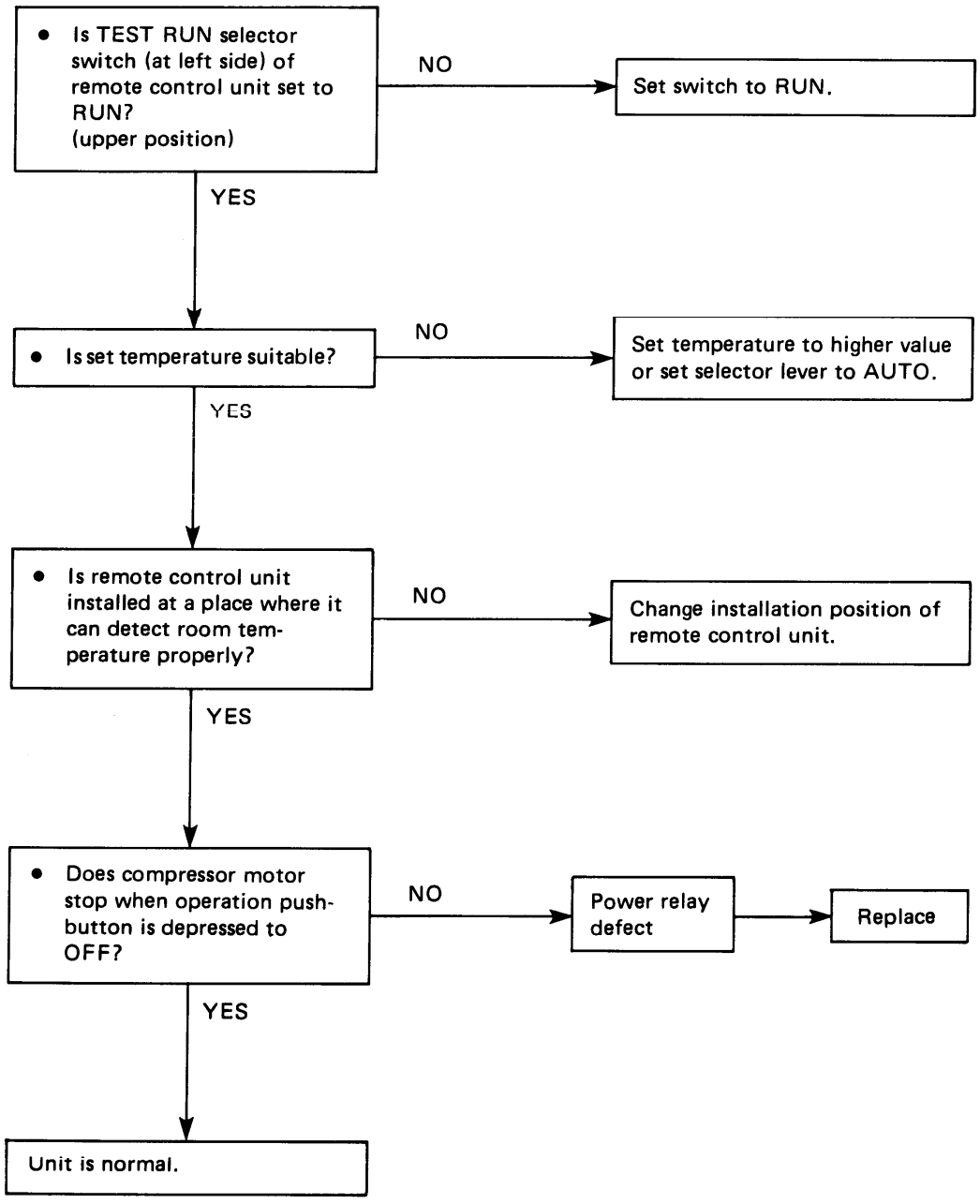

• Check compressor overload relay.
Has overload relay tripped?
YES
Is voltage between terminals No. 1 and No. 2 of terminal base of outdoor unit being switched ON and OFF?
YES
Is coil voltage of power relay of indoor unit being switched ON and OFF?
NO
Power relay defect
Replace
YES
Is outdoor heat exchanger coil dirty or are there obstacles near air suction inlet?
NO
YES
Controller PCB defect
Replace
Clean heat exchanger (or remove obstacles).
• Check power supply voltage. Is voltage abnormally low?
Check voltage between terminals No. 1 and No. 2 at terminal base in the outdoor unit.
Low (103V or less)
Consult power supply company and restore voltage to normal value. (Remove cause for voltage drop)
Voltage is in specified range (115V ±10%).
• Check compressor motor winding.
Refer to ELC-6. (P56)
Replace compressor in case of defect.

3. Air conditioner operates, but abnormalities are observed

3.1 Poor cooling


• Confirm installation position of remote control unit. Does cool air from air conditioner reach position directly?
YES
Change installation position of remote control unit.
NO
• Are wide and narrow pipes between indoor unit and outdoor unit insulated separately?
NO
Insulate wide pipe and narrow pipe separately and then execute taping.
Note: Throttling capillary tube of this model is located in outdoor unit.
YES
• Measure temperatures of suction and discharge air of air conditioner, and compare with the characteristics curve.
Temperature difference is small.
Possibility of gas shortage
Charge refrigerant gas (R22).
Temperature difference between suction and discharge air is large enough (Approx. 55 deg. (F) or more)
• Check for clogging of air filter.
Air filter is clogged.
Clean filter.
• Fan speed is set to LOW.
Set fan speed to either HIGH or MEDIUM.
• Reevaluate cooling load estimate, if performance of air conditioner is normal.
Reduce cooling load or replace the unit with higher cooling capacity.

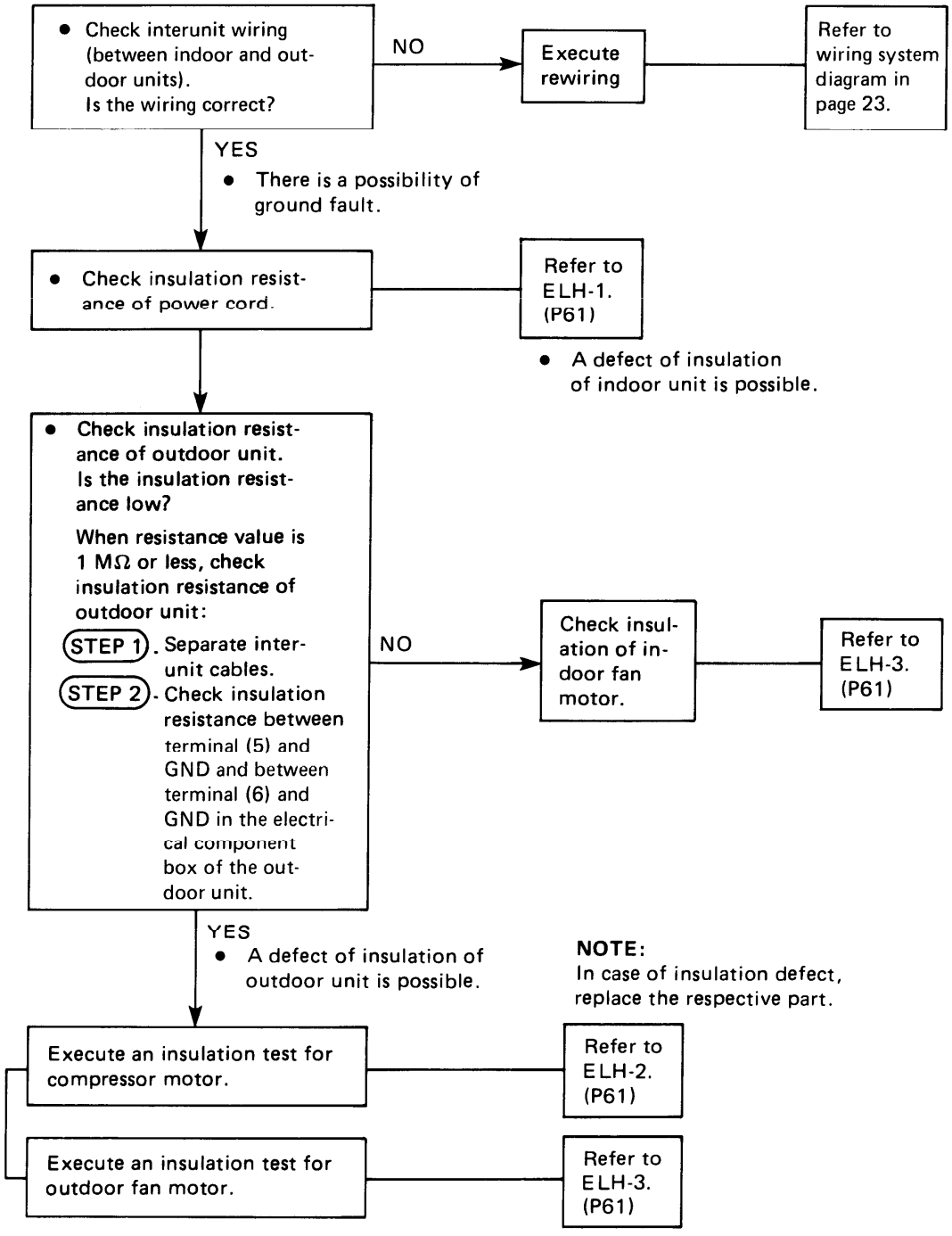
3.2 Excessive cooling


• Is TEST RUN selector switch (at left side) of remote control unit set to RUN? (upper position)
NO
Set switch to RUN.
YES
• Is set temperature suitable?
NO
Set temperature to higher value or set selector lever to AUTO.
YES
• Is remote control unit installed at a place where it can detect room temperature properly?
NO
Change installation position of remote control unit.
YES
• Does compressor motor stop when operation push-button is depressed to OFF?
NO
Power relay defect
Replace
YES
Unit is normal.

1. Air conditioner does not operate

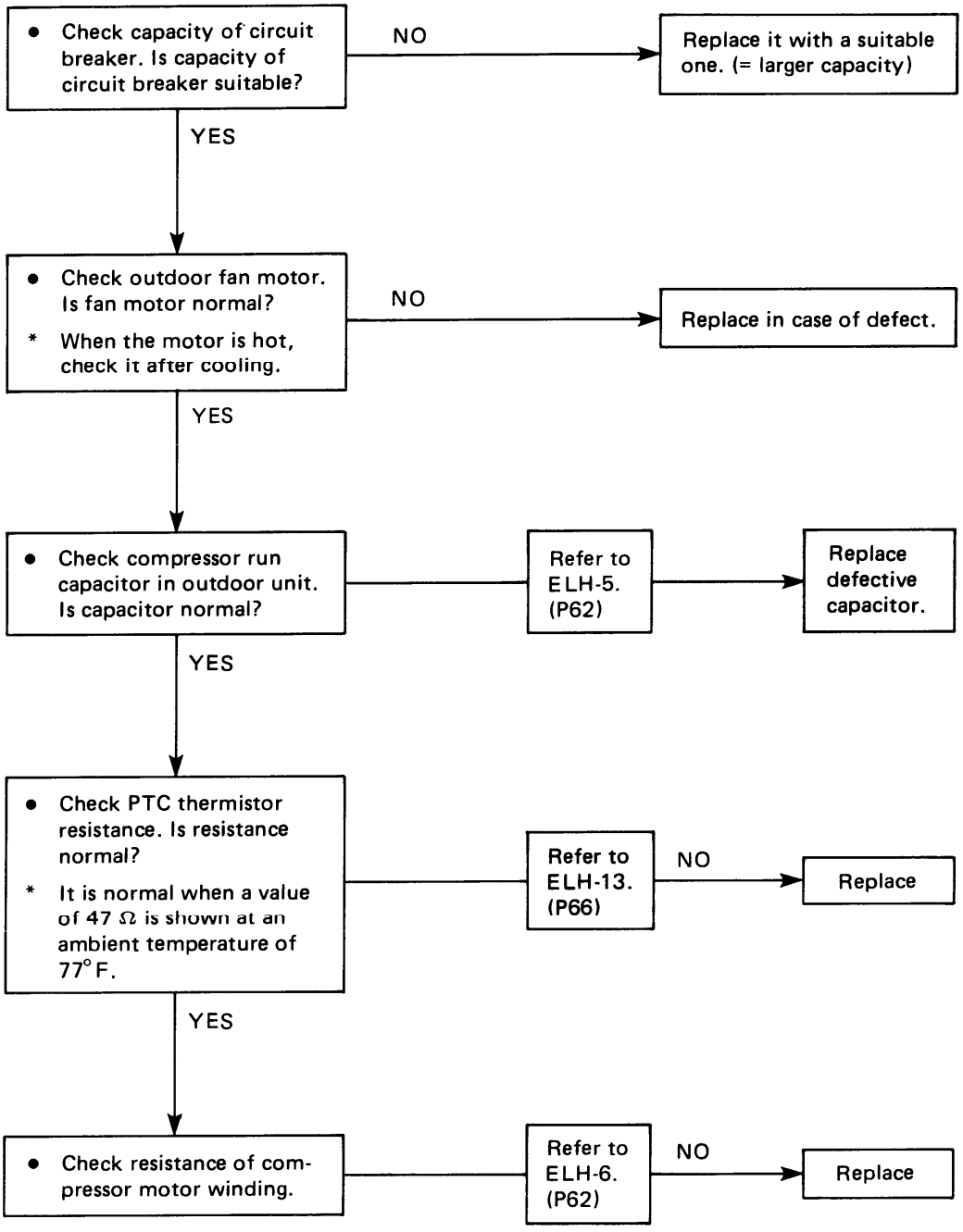
1.1 Circuit breaker trips (or fuse blows)

1.1.1 When circuit breaker is set to ON, it is tripped soon (resetting is not possible)

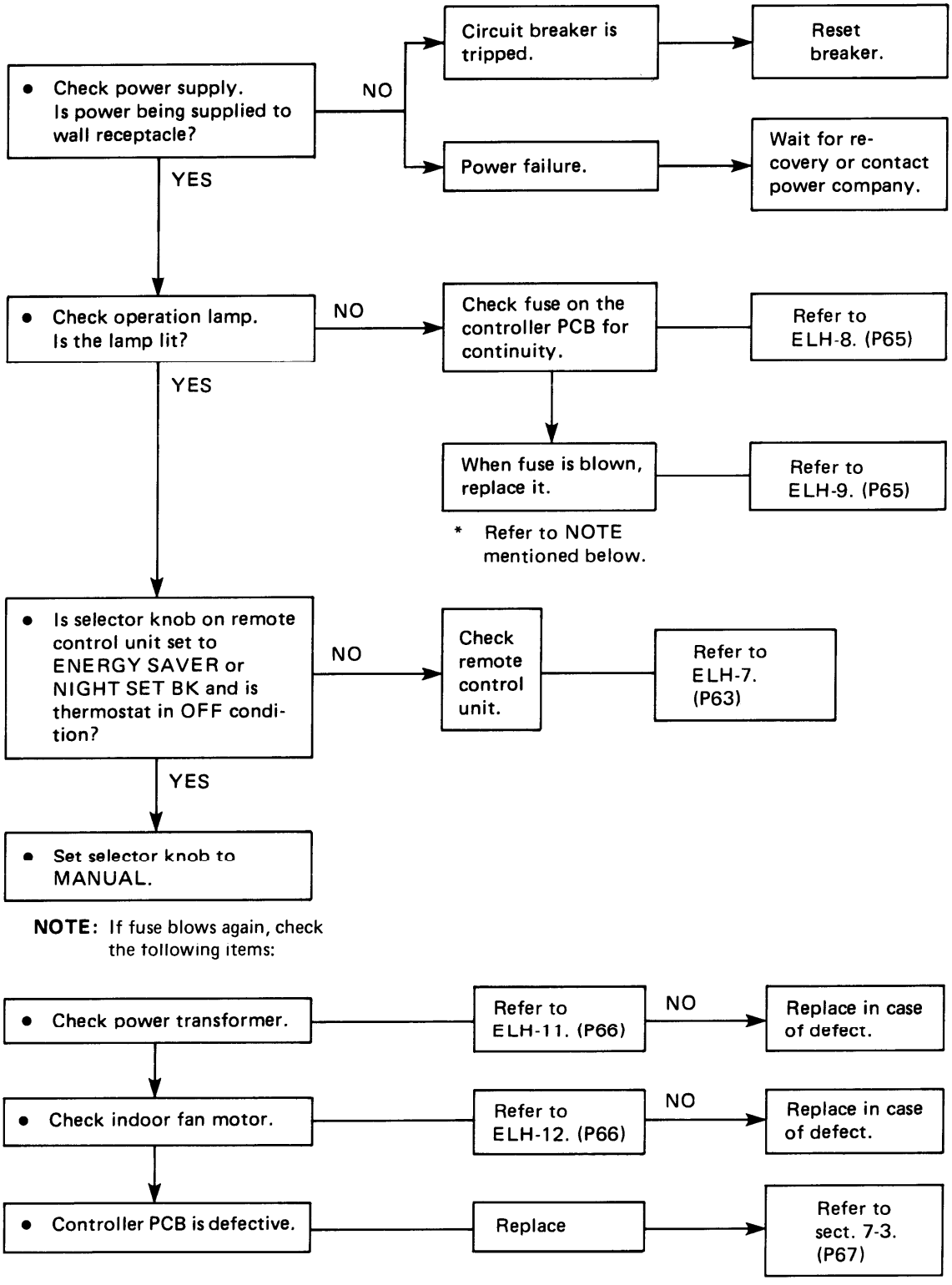

• Check interunit wiring (between indoor and outdoor units). Is the wiring correct?
NO
Execute rewiring
Refer to wiring system diagram in page 23.
YES
• There is a possibility of ground fault.
• Check insulation resistance of power cord.
Refer to ELH-1. (P61)
• A defect of insulation of indoor unit is possible.
• Check insulation resistance of outdoor unit. Is the insulation resistance low?
When resistance value is 1 MΩ or less, check insulation resistance of outdoor unit:
STEP 1. Separate interunit cables.
STEP 2. Check insulation resistance between terminal (5) and GND and between terminal (6) and GND in the electrical component box of the outdoor unit.
NO
Check insulation of indoor fan motor.
Refer to ELH-3. (P61)
YES
• A defect of insulation of outdoor unit is possible.
NOTE:
In case of insulation defect, replace the respective part.
Execute an insulation test for compressor motor.
Refer to ELH-2. (P61)
Execute an insulation test for outdoor fan motor.
Refer to ELH-3. (P61)

3

1.1.2 Circuit breaker trips when the operation switch is depressed.


• Check capacity of circuit breaker. Is capacity of circuit breaker suitable?
NO
Replace it with a suitable one. (= larger capacity)
YES
• Check outdoor fan motor. Is fan motor normal?
* When the motor is hot, check it after cooling.
NO
Replace in case of defect.
YES
• Check compressor run capacitor in outdoor unit. Is capacitor normal?
Refer to ELH-5. (P62)
Replace defective capacitor.
YES
• Check PTC thermistor resistance. Is resistance normal?
* It is normal when a value of 47 Ω is shown at an ambient temperature of 77°F.
Refer to ELH-13. (P66)
NO
Replace
YES
• Check resistance of compressor motor winding.
Refer to ELH-6. (P62)
NO
Replace

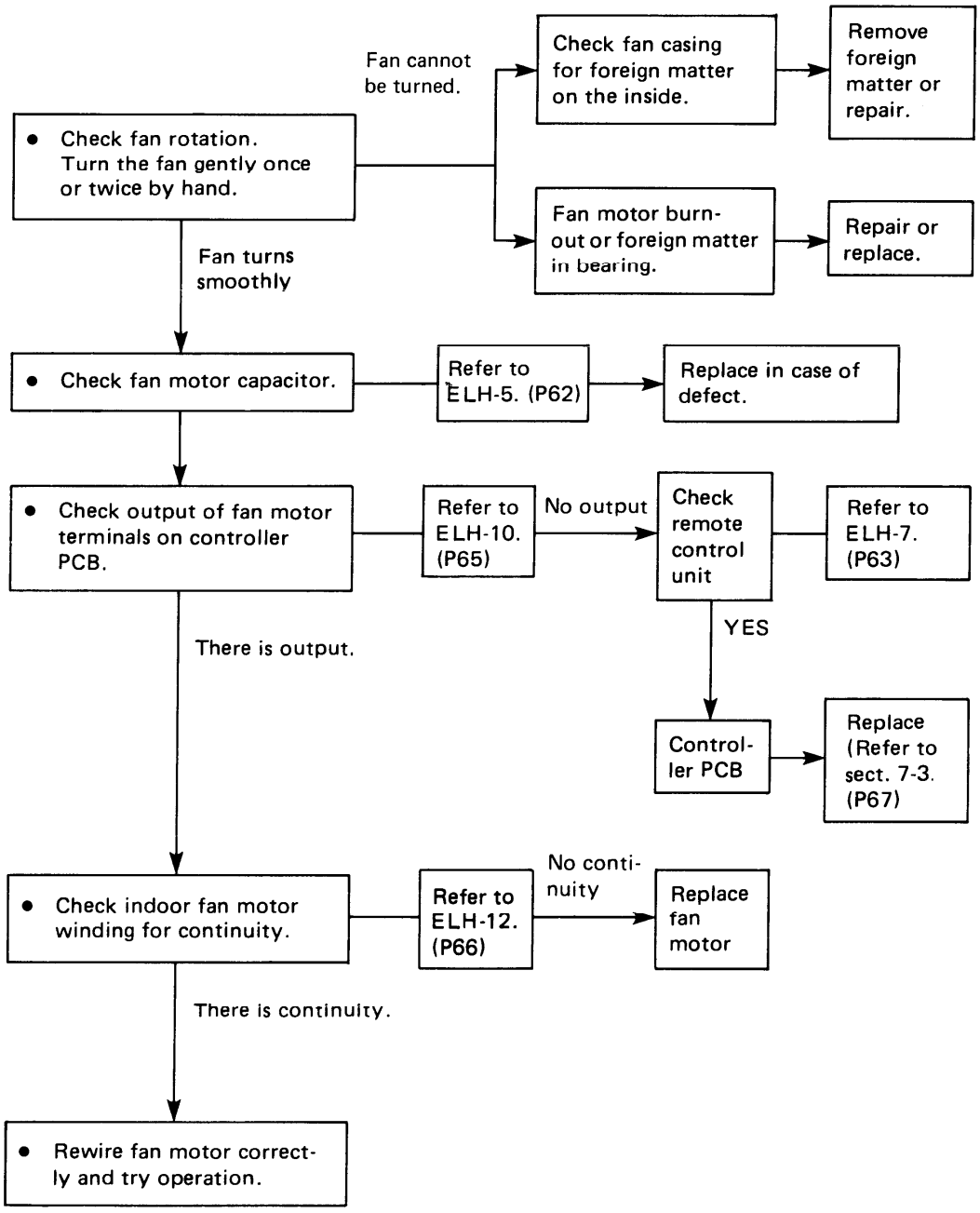
1.2 Neither indoor unit nor outdoor unit run


• Check power supply. Is power being supplied to wall receptacle?
NO
Circuit breaker is tripped.
Reset breaker.
Power failure.
Wait for recovery or contact power company.
YES
• Check operation lamp. Is the lamp lit?
NO
Check fuse on the controller PCB for continuity.
Refer to ELH-8. (P65)
When fuse is blown, replace it.
Refer to ELH-9. (P65)
YES
* Refer to NOTE mentioned below.
• Is selector knob on remote control unit set to ENERGY SAVER or NIGHT SET BK and is thermostat in OFF condition?
NO
Check remote control unit.
Refer to ELH-7. (P63)
YES
• Set selector knob to MANUAL.
NOTE: If fuse blows again, check the following items:
• Check power transformer.
Refer to ELH-11. (P66)
NO
Replace in case of defect.
• Check indoor fan motor.
Refer to ELH-12. (P66)
NO
Replace in case of defect.
• Controller PCB is defective.
Replace
Refer to sect. 7-3. (P67)

3

2. Some part of air conditioner does not operate

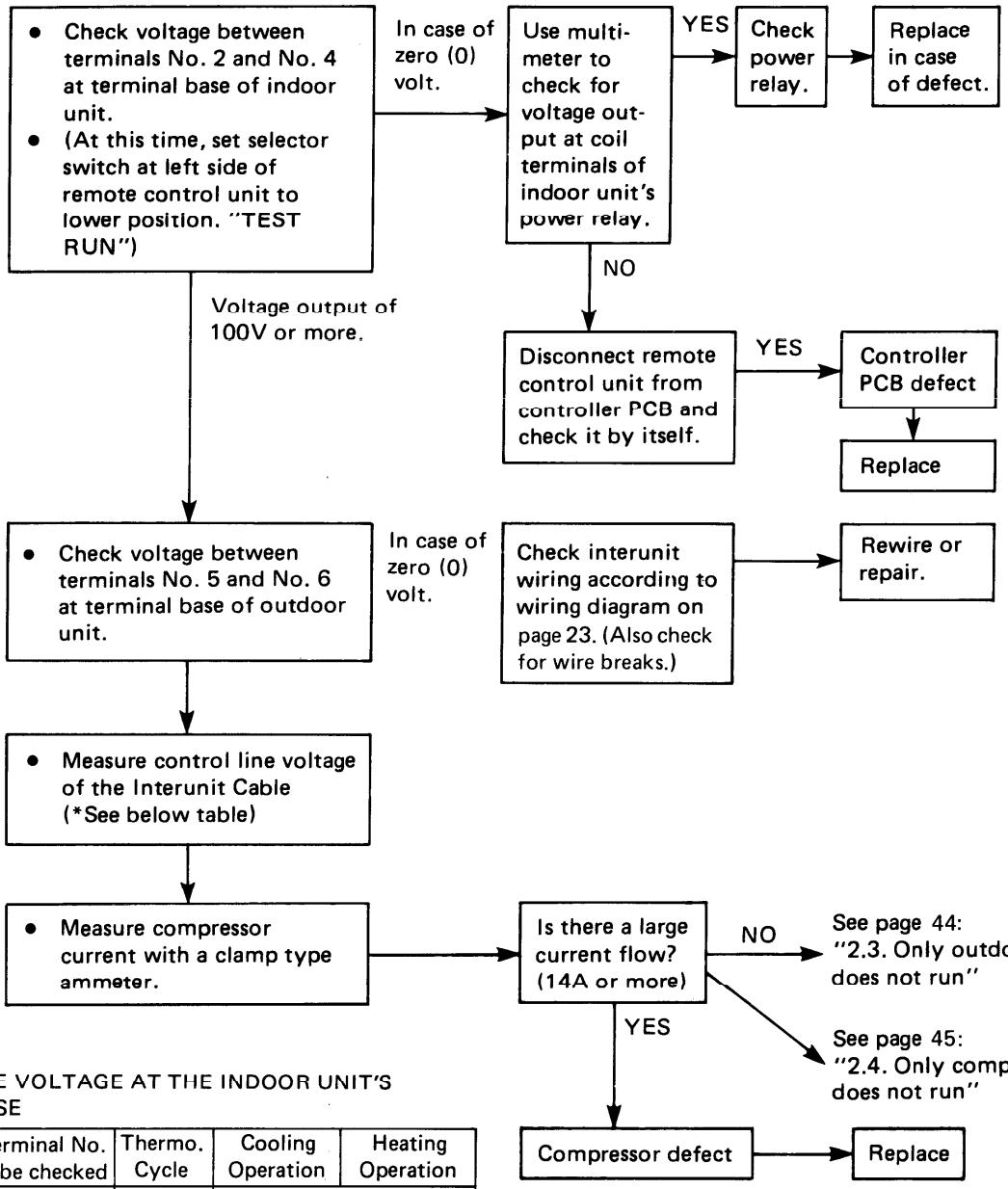
2.1 Indoor fan does not run


Fan cannot be turned.
Check fan casing for foreign matter on the inside.
Remove foreign matter or repair.
• Check fan rotation. Turn the fan gently once or twice by hand.
Fan motor burn-out or foreign matter in bearing.
Repair or replace.
Fan turns smoothly
• Check fan motor capacitor.
Refer to ELH-5. (P62)
Replace in case of defect.
• Check output of fan motor terminals on controller PCB.
Refer to ELH-10. (P65)
No output
Check remote control unit
Refer to ELH-7. (P63)
YES
There is output.
Control-ler PCB
Replace (Refer to sect. 7-3. (P67)
No conti-nuity
• Check indoor fan motor winding for continuity.
Refer to ELH-12. (P66)
Replace fan motor
There is continuity.
• Rewire fan motor correct-ly and try operation.

2.2 Neither outdoor fan nor compressor do not run

Note: Check following points at first;

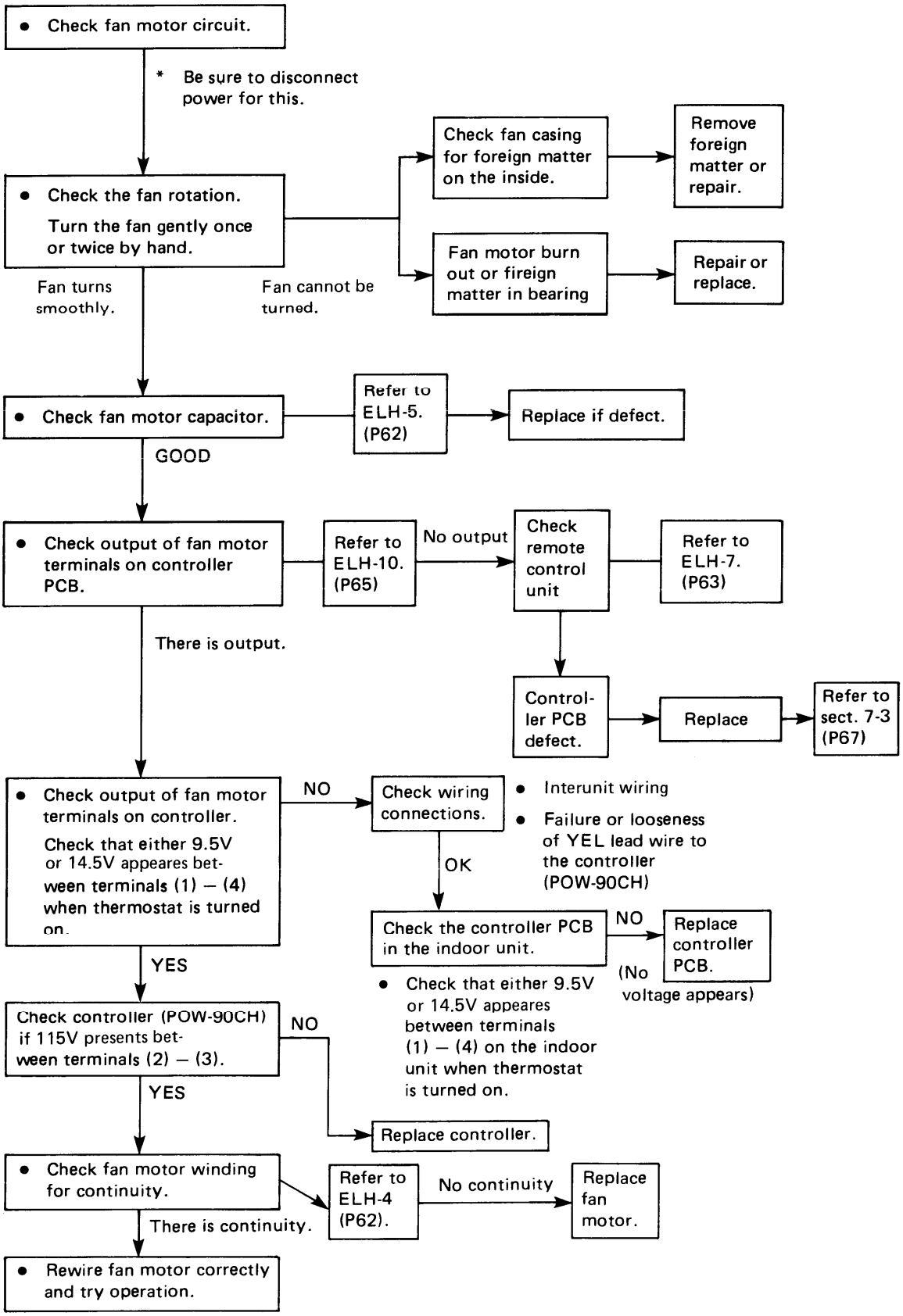
1. Is thermostat setting suitable?
2. Has 3 minute timer operated?
   (No operation for 3 minutes after power ON.)


• Check voltage between terminals No. 2 and No. 4 at terminal base of indoor unit.
• (At this time, set selector switch at left side of remote control unit to lower position. "TEST RUN")
In case of zero (0) volt.
Use multi-meter to check for voltage output at coil terminals of indoor unit's power relay.
YES
Check power relay.
Replace in case of defect.
NO
Voltage output of 100V or more.
Disconnect remote control unit from controller PCB and check it by itself.
YES
Controller PCB defect
Replace
• Check voltage between terminals No. 5 and No. 6 at terminal base of outdoor unit.
In case of zero (0) volt.
Check interunit wiring according to wiring diagram on page 23. (Also check for wire breaks.)
Rewire or repair.
• Measure control line voltage of the Interunit Cable (*See below table)
• Measure compressor current with a clamp type ammeter.
Is there a large current flow? (14A or more)
NO
See page 44: "2.3. Only outdoor fan does not run"
YES
See page 45: "2.4. Only compressor does not run"
Compressor defect
Replace

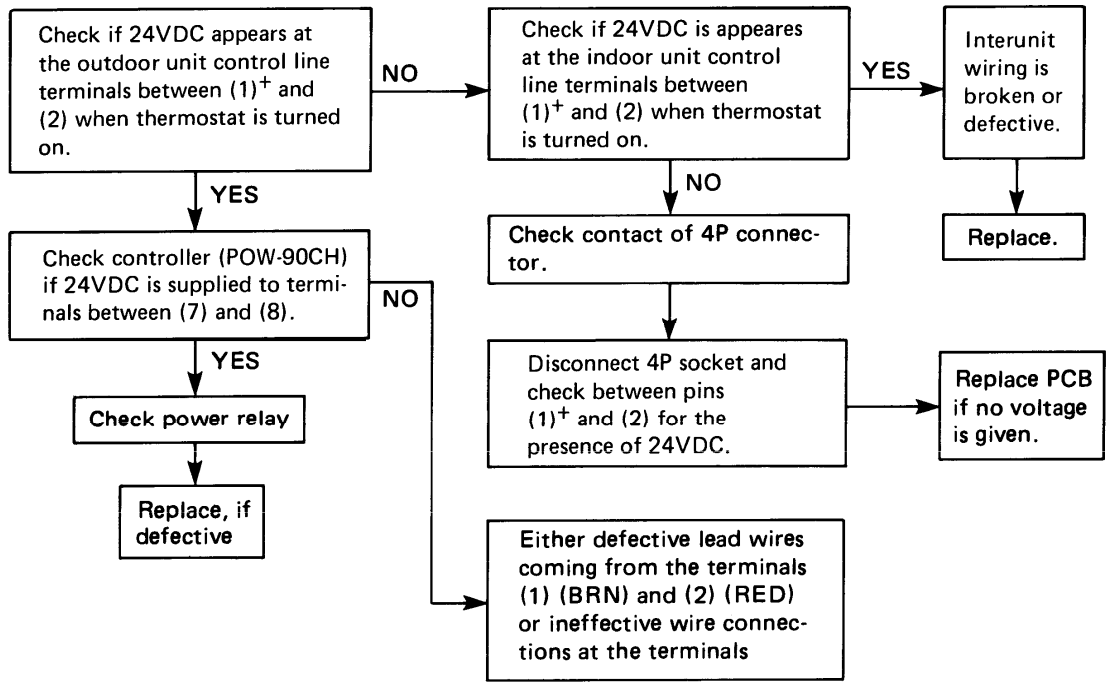
* CONTROL LINE VOLTAGE AT THE INDOOR UNIT'S TERMINAL BASE

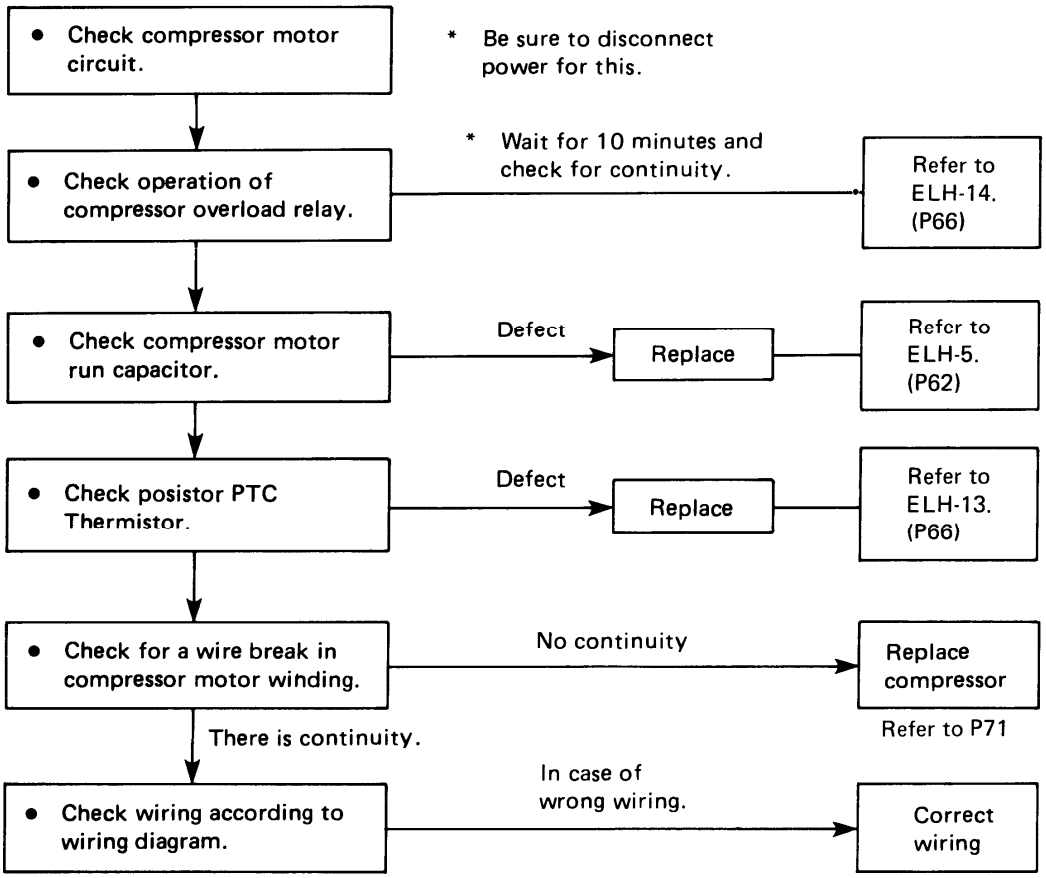
Signal	Terminal No. to be checked	Thermo. Cycle	Cooling Operation	Heating Operation
Compressor ON – OFF	1 – 2	ON	DC 24V	
		OFF	0 V	
Heating	1 – 3	–	0 V	DC 24 V
				* 0 V when defrosting
Fan motor ON – OFF	1 – 4	ON	Approx. 9.5 V or 14.5 V	
		OFF	0 V (Defrosting and Overload Condition are included)	

2.3 Only outdoor fan does not run


• Check fan motor circuit.
* Be sure to disconnect power for this.
• Check the fan rotation.
Turn the fan gently once or twice by hand.
Fan turns smoothly.
Fan cannot be turned.
Check fan casing for foreign matter on the inside.
Remove foreign matter or repair.
Fan motor burn out or fireign matter in bearing
Repair or replace.
• Check fan motor capacitor.
Refer to ELH-5. (P62)
Replace if defect.
GOOD
• Check output of fan motor terminals on controller PCB.
Refer to ELH-10. (P65)
No output
Check remote control unit
Refer to ELH-7. (P63)
There is output.
Control-ler PCB defect.
Replace
Refer to sect. 7-3 (P67)
• Check output of fan motor terminals on controller.
Check that either 9.5V or 14.5V appeares between terminals (1) – (4) when thermostat is turned on.
NO
Check wiring connections.
• Interunit wiring
• Failure or looseness of YEL lead wire to the controller (POW-90CH)
OK
Check the controller PCB in the indoor unit.
NO
Replace controller PCB.
(No voltage appears)
• Check that either 9.5V or 14.5V appeares between terminals (1) – (4) on the indoor unit when thermostat is turned on.
YES
Check controller (POW-90CH) if 115V presents between terminals (2) – (3).
NO
YES
Replace controller.
• Check fan motor winding for continuity.
Refer to ELH-4 (P62).
No continuity
Replace fan motor.
There is continuity.
• Rewire fan motor correctly and try operation.

2.4 Only compressor does not run

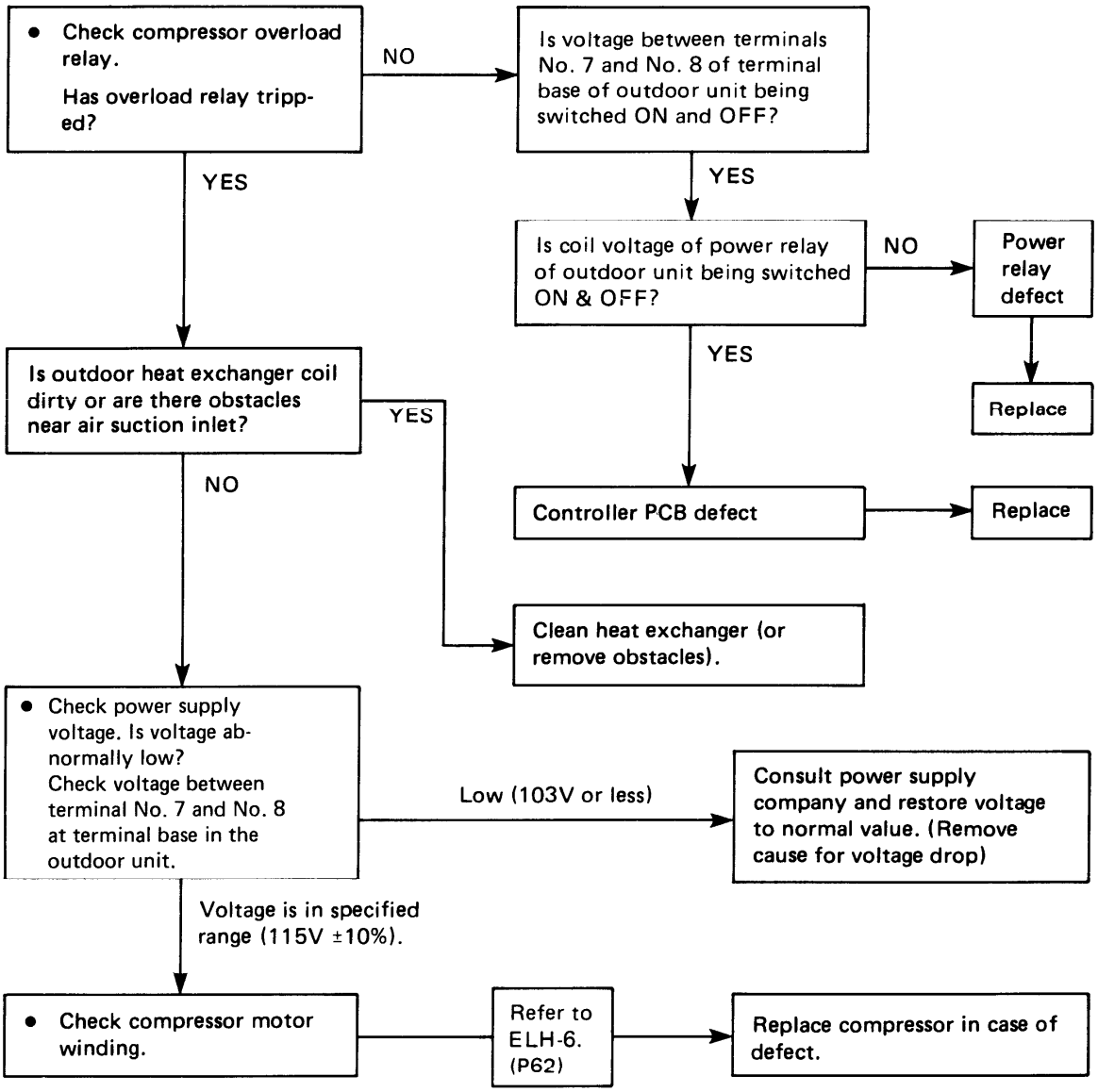

Check if 24VDC appears at the outdoor unit control line terminals between (1)+ and (2) when thermostat is turned on.
NO
Check if 24VDC is appeares at the indoor unit control line terminals between (1)+ and (2) when thermostat is turned on.
YES
Interunit wiring is broken or defective.
Replace.
YES
NO
Check contact of 4P connector.
Check controller (POW-90CH) if 24VDC is supplied to terminals between (7) and (8).
NO
YES
Disconnect 4P socket and check between pins (1)+ and (2) for the presence of 24VDC.
Replace PCB if no voltage is given.
Check power relay
Replace, if defective
Either defective lead wires coming from the terminals (1) (BRN) and (2) (RED) or ineffective wire connections at the terminals


• Check compressor motor circuit.
* Be sure to disconnect power for this.
* Wait for 10 minutes and check for continuity.
• Check operation of compressor overload relay.
Refer to ELH-14. (P66)
• Check compressor motor run capacitor.
Defect
Replace
Refer to ELH-5. (P62)
• Check posistor PTC Thermistor.
Defect
Replace
Refer to ELH-13. (P66)
• Check for a wire break in compressor motor winding.
No continuity
Replace compressor
Refer to P71
There is continuity.
• Check wiring according to wiring diagram.
In case of wrong wiring.
Correct wiring

3

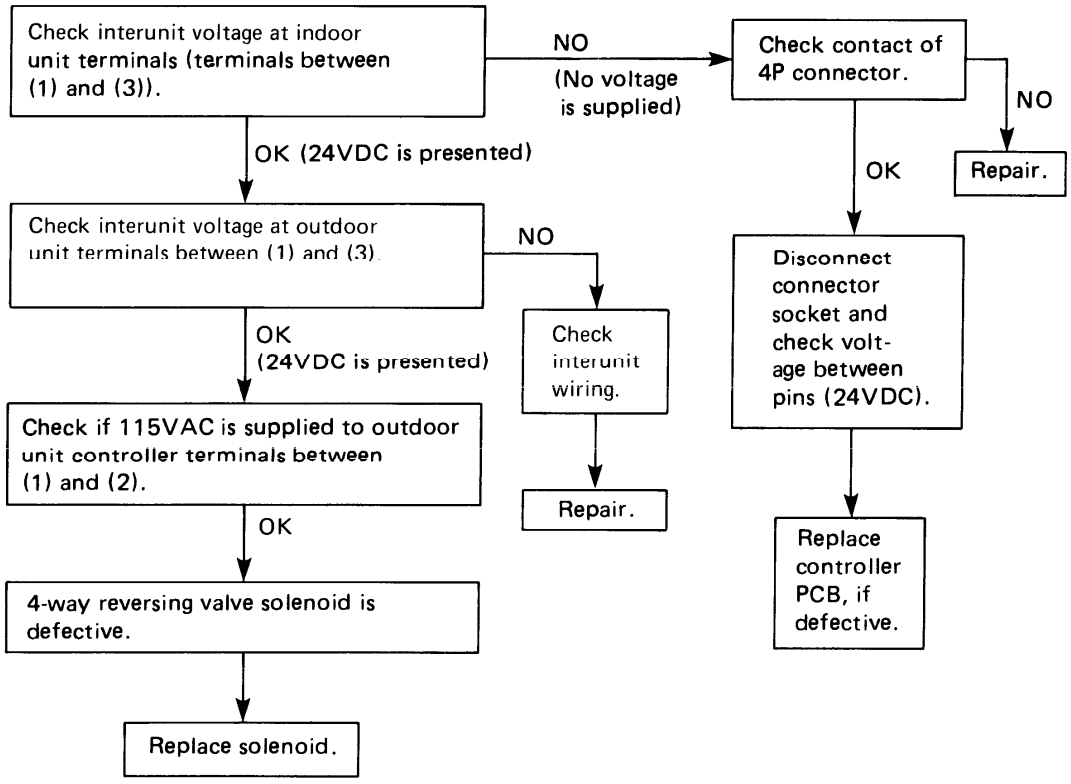
2.5 Compressor frequently repeats ON and OFF

(Only compressor repeats ON and OFF, while indoor unit and outdoor fan runs without fail.)


• Check compressor overload relay.
Has overload relay tripped?
NO
Is voltage between terminals No. 7 and No. 8 of terminal base of outdoor unit being switched ON and OFF?
YES
YES
Is coil voltage of power relay of outdoor unit being switched ON & OFF?
NO
Power relay defect
Replace
YES
Is outdoor heat exchanger coil dirty or are there obstacles near air suction inlet?
YES
NO
Controller PCB defect
Replace
Clean heat exchanger (or remove obstacles).
• Check power supply voltage. Is voltage abnormally low?
Check voltage between terminal No. 7 and No. 8 at terminal base in the outdoor unit.
Low (103V or less)
Consult power supply company and restore voltage to normal value. (Remove cause for voltage drop)
Voltage is in specified range (115V ±10%).
• Check compressor motor winding.
Refer to ELH-6. (P62)
Replace compressor in case of defect.

2.6. Air conditioner will not enter into heating mode (only cooling is possible).

1) Heating operation cannot be done (4-way reversing valve malfunction).


Check interunit voltage at indoor unit terminals (terminals between (1) and (3)).
NO
(No voltage is supplied)
Check contact of 4P connector.
NO
Repair.
OK
OK (24VDC is presented)
Check interunit voltage at outdoor unit terminals between (1) and (3).
NO
Disconnect connector socket and check voltage between pins (24VDC).
OK
(24VDC is presented)
Check interunit wiring.
Repair.
Check if 115VAC is supplied to outdoor unit controller terminals between (1) and (2).
OK
Replace controller PCB, if defective.
4-way reversing valve solenoid is defective.
Replace solenoid.

2) Defrosting system malfunction

2-1. Defrosting can be achieved after continuous operation of the unit for a long time.

- Remove defrost thermostat from the controller (outdoor unit) terminals (5) and (6) and check for conductivity.

  Defrost thermostat is normal if following conditions will be satisfied:

OFF	Maximum 39° F	ON	Minimum 54° F

If the thermostat stays ON below 39° F, it is defective. ⟶ Replace the thermostat.

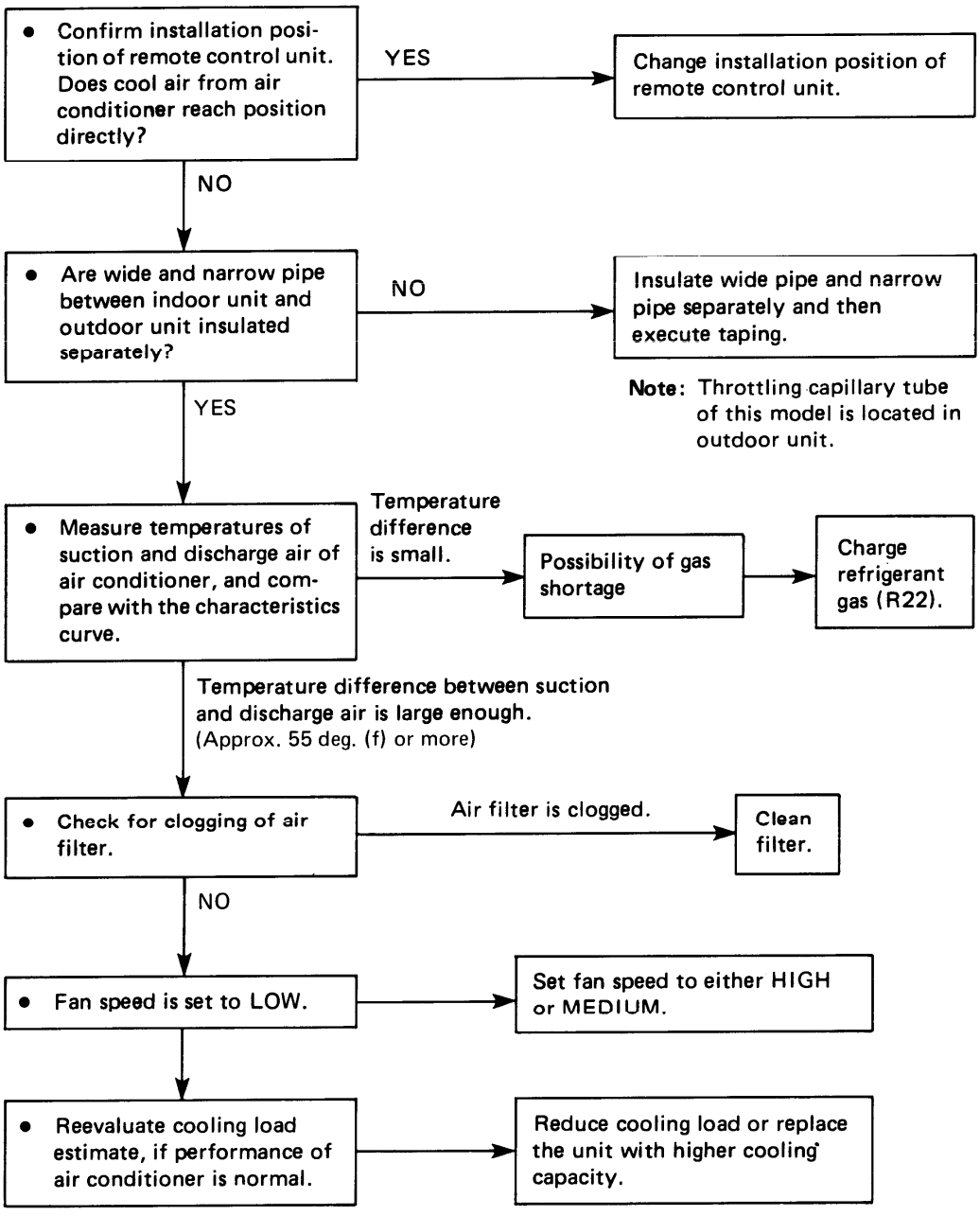
2-2. No defrosting will be taken place at all.

Controller PCB (indoor unit) is defective. ⟶ Replace the controller PCB.

3

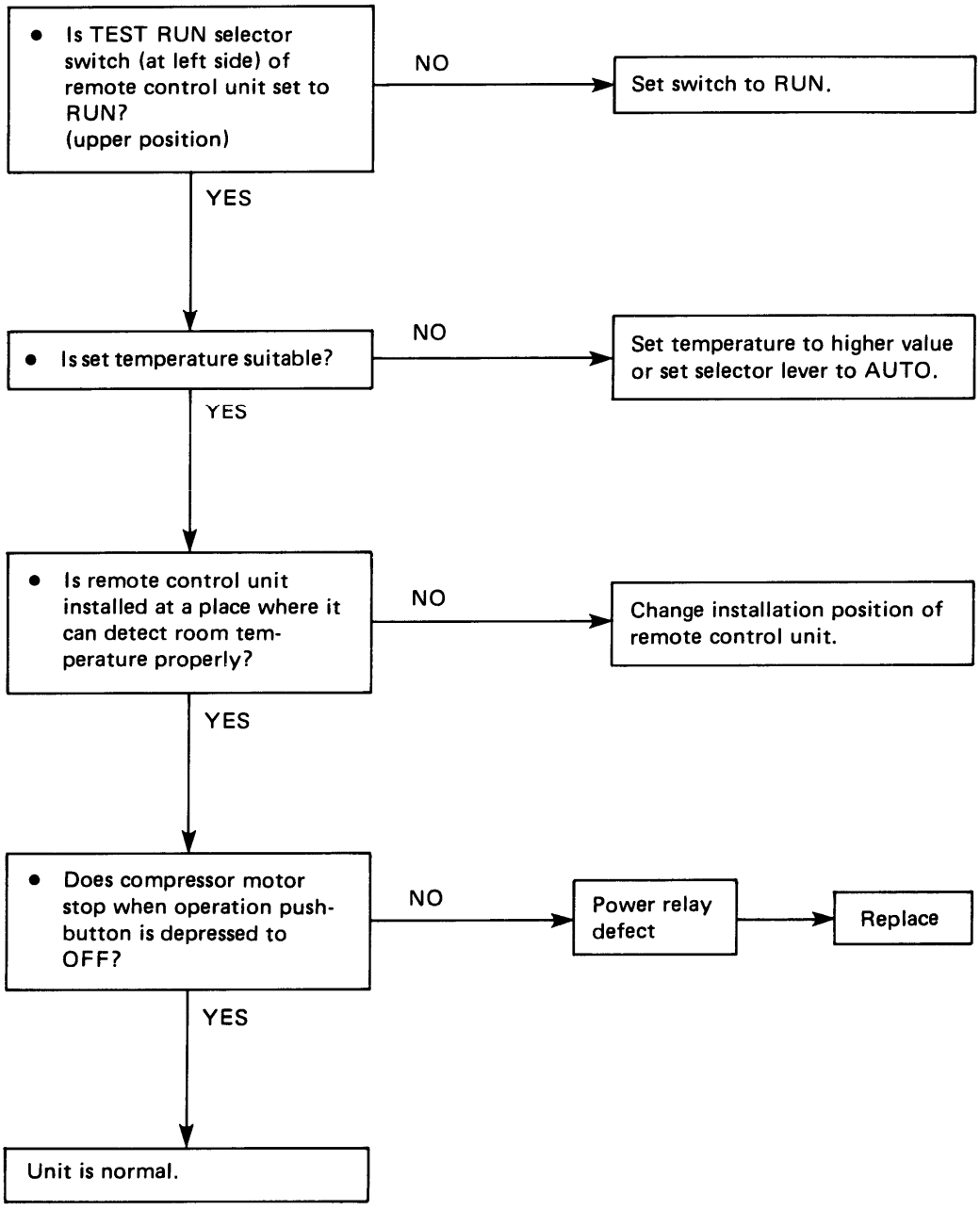
3. Air conditioner operates, but abnormalities are observed

3.1 Poor cooling (or heating*)


• Confirm installation position of remote control unit. Does cool air from air conditioner reach position directly?
YES
Change installation position of remote control unit.
NO
• Are wide and narrow pipe between indoor unit and outdoor unit insulated separately?
NO
Insulate wide pipe and narrow pipe separately and then execute taping.
Note: Throttling capillary tube of this model is located in outdoor unit.
YES
• Measure temperatures of suction and discharge air of air conditioner, and compare with the characteristics curve.
Temperature difference is small.
Possibility of gas shortage
Charge refrigerant gas (R22).
Temperature difference between suction and discharge air is large enough.
(Approx. 55 deg. (f) or more)
• Check for clogging of air filter.
Air filter is clogged.
Clean filter.
NO
• Fan speed is set to LOW.
Set fan speed to either HIGH or MEDIUM.
• Reevaluate cooling load estimate, if performance of air conditioner is normal.
Reduce cooling load or replace the unit with higher cooling capacity.
Heating

Note: * If outdoor ambient temp. falls below 35°F, heating capacity may be reduced greatly. In this case, use supplementary heating appliances.

3.2 Excessive cooling


• Is TEST RUN selector switch (at left side) of remote control unit set to RUN? (upper position)
NO
Set switch to RUN.
YES
• Is set temperature suitable?
NO
Set temperature to higher value or set selector lever to AUTO.
YES
• Is remote control unit installed at a place where it can detect room temperature properly?
NO
Change installation position of remote control unit.
YES
• Does compressor motor stop when operation push-button is depressed to OFF?
NO
Power relay defect
Replace
YES
Unit is normal.

4. Respective Operation Modes at the Time of Heating

This system is so designed as to maintain a comfortable room temperature during heating operation according to the sequences described below.

1) Cold Draft Prevention (=Standby) Mode:

When the standby lamp lights on, the indoor fan motor stops, and blowout of cool air is prevented. This takes place in the following cases.

a) When compressor is turned off by the thermostat at the beginning of heating operation, and when the temperature in the indoor heat exchanger is about 77° F (25° C) or lower.

b) During defrosting (normally, 7 – 8 min.) and right after changeover to heating from defrosting.

2) Defrosting Mode:

When the capacity of unit has been decreased due to frost sticking to the outdoor heat exchanger during heating, the temperature drop gradient is detected by the microcomputer controlled temperature sensing system, and defrosting operation is started. At this time, the indoor and outdoor fan motors will stop, only the compressor is operated, and the system is automatically changed to cooling operation mode.

3) Thermo. Cycle Operation Mode:

30 seconds after the compressor has been shut down due to the action of thermostat, the indoor fan motor will stop to prevent blowout of cool air.

NOTE: The standby lamp will not be lit on at the time of ENERGY SAVER and NIGHT SETBACK programs.

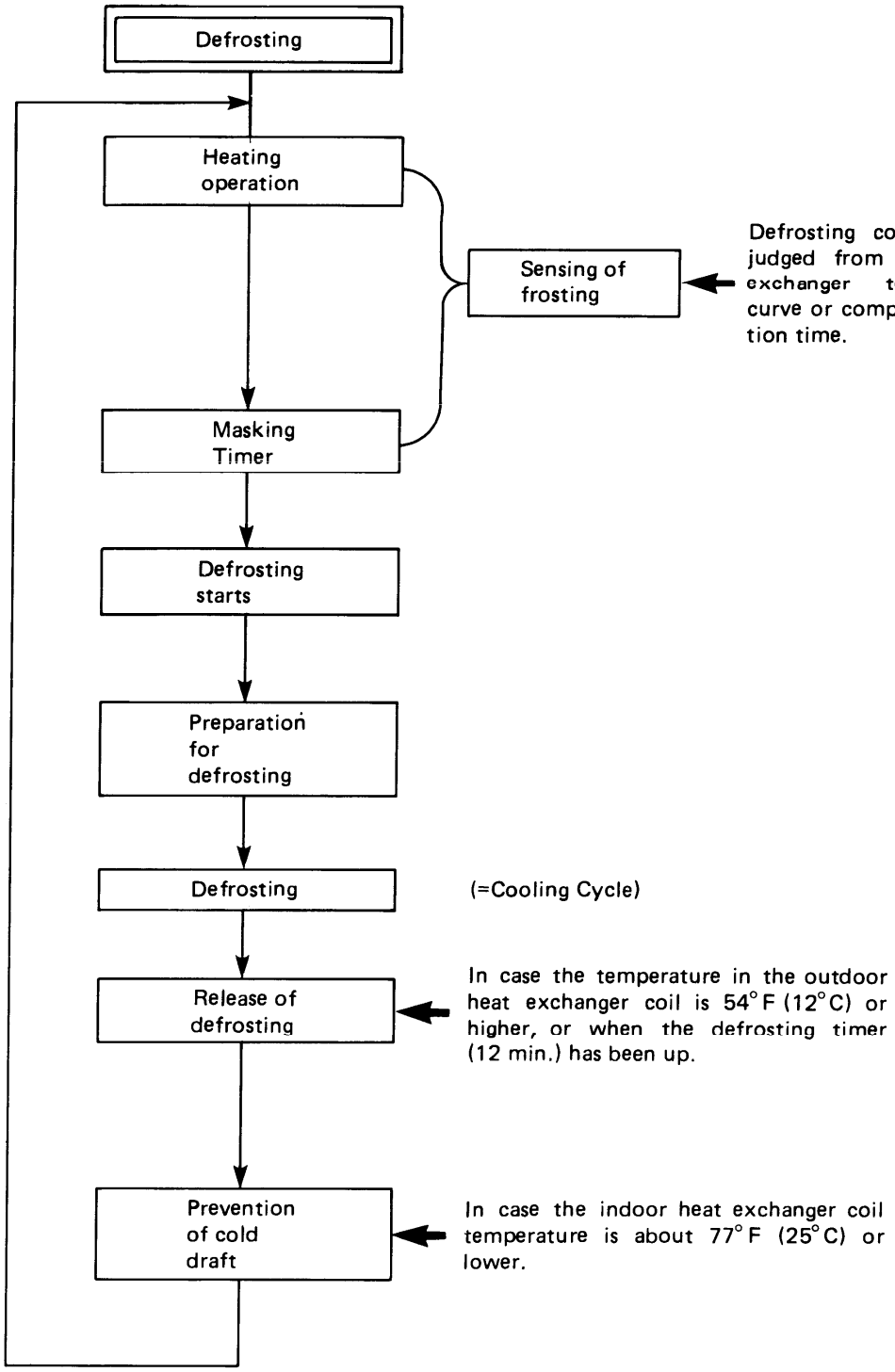
4) Overload Preventive Mechanism:

When the temperature in the indoor heat exchanger has been 127° F (53° C) or higher, the indoor fan speed will automatically be changed to HIGH. Moreover, when the temperature in the indoor heat exchanger has become 131° F (55° C) or higher, the outdoor fan motor will stop.

5) Automatic Fan Speed Control:

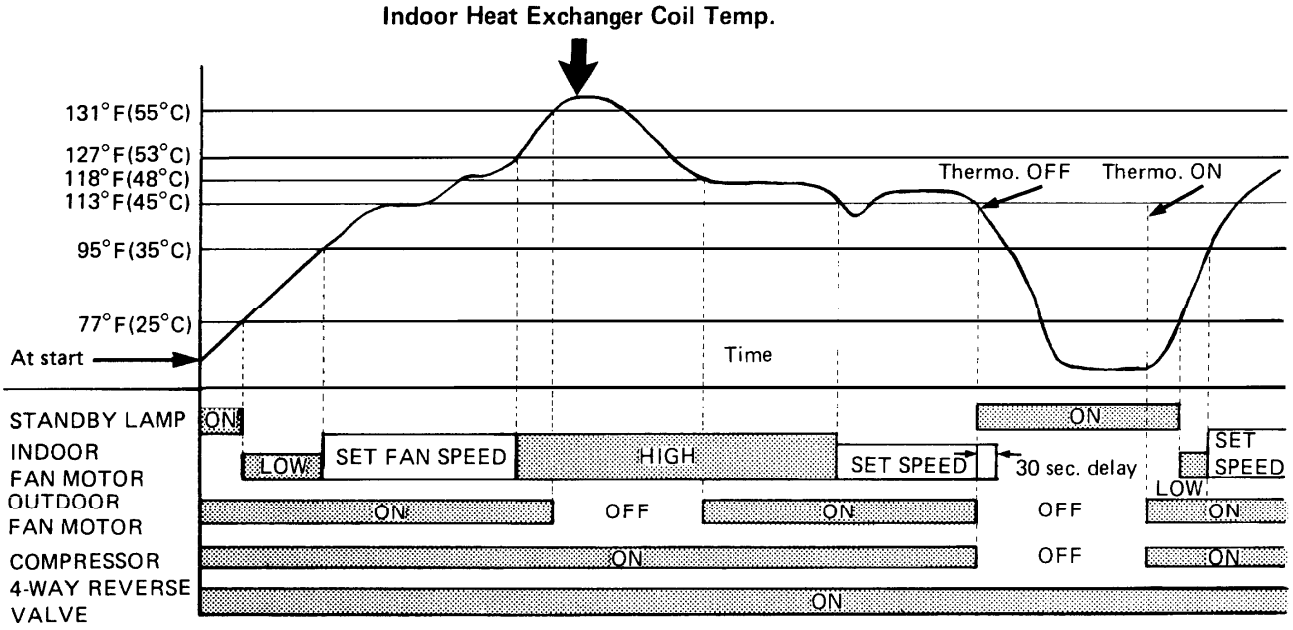
When the fan speed has been set to AUTO, the difference between the set temperature of thermostat and actual room temperature will be sensed by the thermistor, the fan speed will be changed to either of the two stages, High or Medium automatically by the aid of microcomputer.

6) Flow of Defrosting

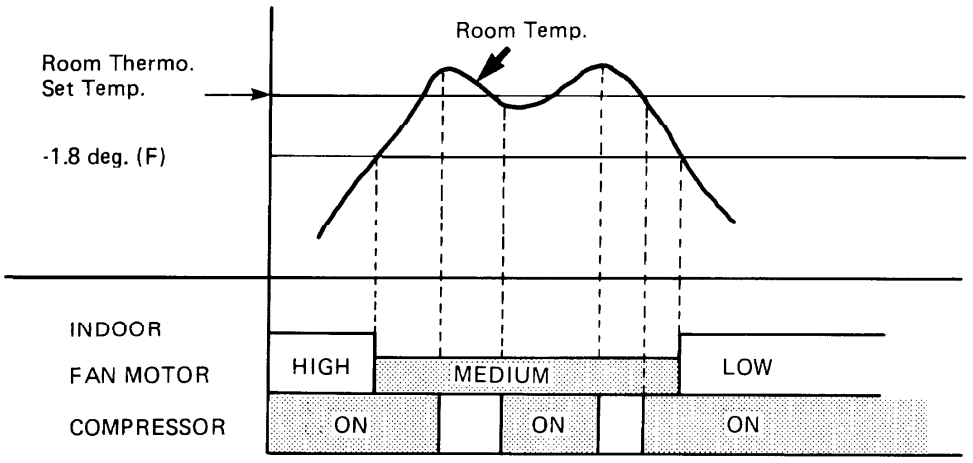

Defrosting
Heating operation
Sensing of frosting
Defrosting conditions are judged from indoor heat exchanger temp. drop curve or compressor operation time.
Masking Timer
Defrosting starts
Preparation for defrosting
Defrosting
(=Cooling Cycle)
Release of defrosting
In case the temperature in the outdoor heat exchanger coil is 54°F (12°C) or higher, or when the defrosting timer (12 min.) has been up.
Prevention of cold draft
In case the indoor heat exchanger coil temperature is about 77°F (25°C) or lower.

3

The sequence described in 1) – 5) are as illustrated in the following flow chart.



■ Automatic Fan Speed Control in Heating Mode:



6. CHECKING AND REPLACING ELECTRICAL COMPONENTS

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4

ELA. Connector Identification on Controller PCB

POW-12KU (For SAP91KC & SAP121KC)

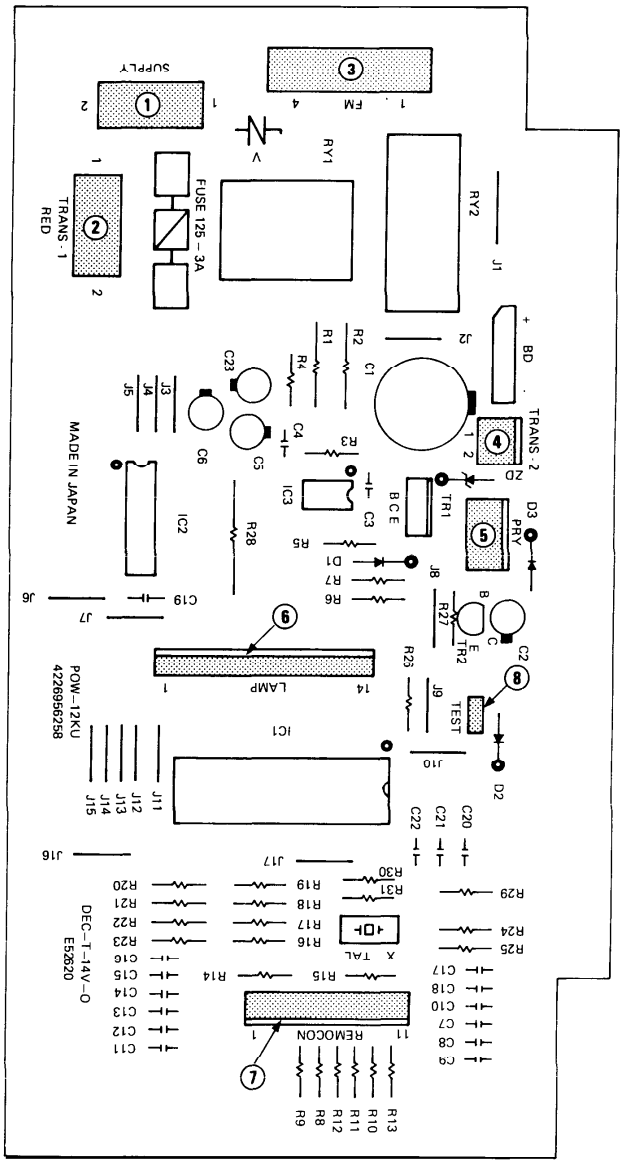

Fig. E-A

1. Connector, Power Supply to PCB **115V**
2. Connector, Transformer (Primary: **115V**)
3. Connector, Fan Motor **115V**
4. Connector, Transformer (Secondary: 19V)
5. Connector, Power Relay 24V
6. Connector, Lamp Board Ass'y 24V
7. Connector, Remote Control Unit 24V
8. Connector, Test Run 24V

POW-9KHU (For SAP90KCH)

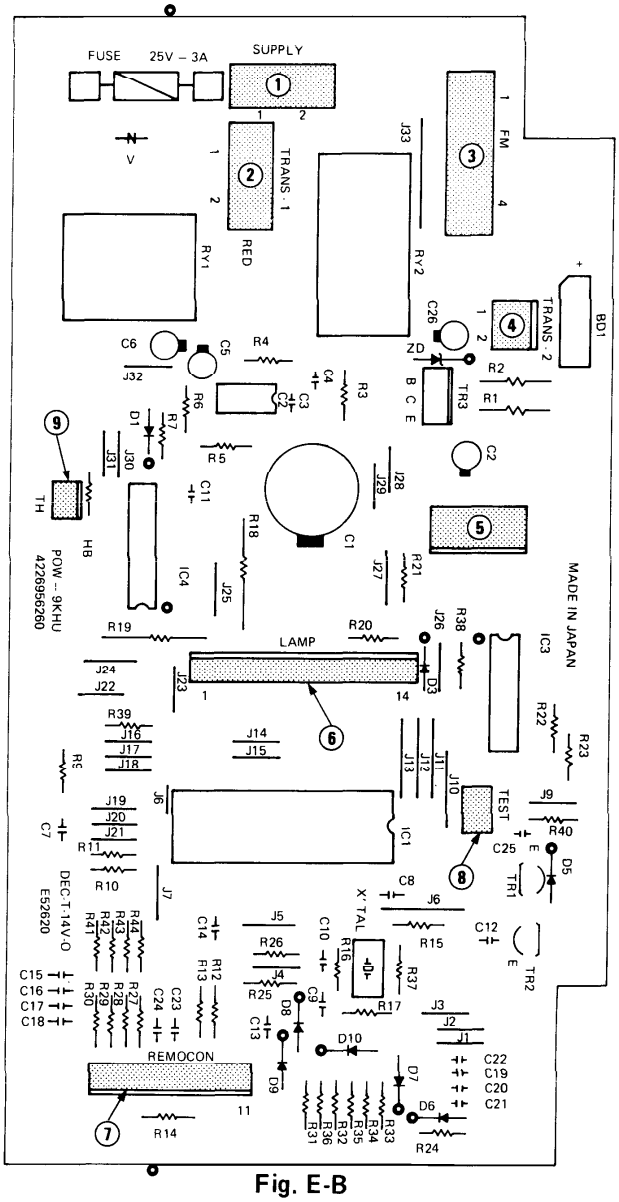

Fig. E-B

1. Connector, Power Supply to PCB **115V**
2. Connector, Transformer (Primary: **115V**)
3. Connector, Fan Motor **115V**
4. Connector, Transformer (Secondary: 19V)
5. Connector, Power Relay 24V
6. Connector, Lamp Board Ass'y 24V
7. Connector, Remote Control Unit 24V
8. Connector, Test Run 24V
9. Connector, Thermistor Sensor 24V

ELC-1. Measurement of Insulation Resistance of the Power Cord

Clamp the ground (GND) line of the Power Cord with a lead clip of the insulation resistance tester and measure the resistance by placing a probe on either of the two power lines.

Then also meaure the resistance between the GND line and the other power line. The insulation is in good condition if the resistance exceeds 1 MΩ.

Then also measure the resistance between the ground and the other power line. The insulation is in good condition if the resistance exceeds 1MΩ (Fig. E-1).

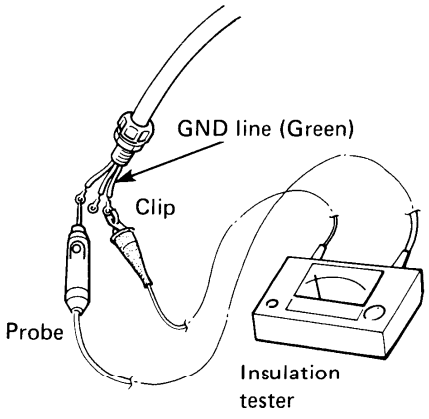

Fig. E-1

ELC-2. Measurement of Insulation Resistance of the compressor

Remove the red lead wire connected to the compressor motor from (4) on the terminal base. Clamp the removed black lead wire with a lead clip of the insulation resistance tester and measure the resistance by placing a probe of the tester to the terminal GND, to which green lead wire is connected.

The insulation is in good condition if the resistance exceeds 1 MΩ(Fig. E-2).

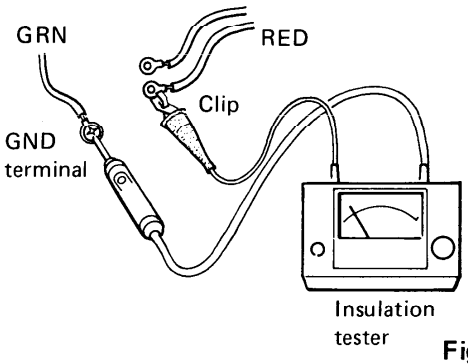

Fig. E-2

ELC-3. Measurement of Insulation Resistance of the Fan Motor

3.1. In case of indoor fan motor

Remove the fan motor connector from controller PCB (P54, Fig. E-A). Clamp the green lead wire (at the bear section) extended from the terminal GND in the electrical component box and measure insulation resistance by placing a probe of the insulation tester to either pole of this connector.

The insulation is in good condition if the resistance exceeds 1 MΩ. Fig. E-3.

Note:
If the probe does not enter the pole because the hole is too narrow then use a probe with a thinner pin.

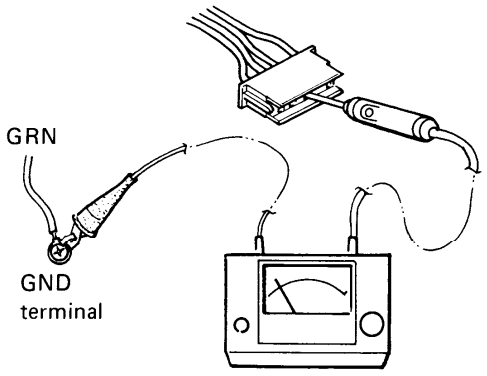

Fig. E-3

3.2. In case of outdoor fan motor

Remove the blue lead wire of the fan motor from (4) on the terminal base. Clamp this lead wire with a lead clip of the insulation resistance tester and measure the resistance by placing a probe of the tester to the terminal GND.

The insulation is in good condition if the resistance exceeds 1 MΩ. Fig. E-4.

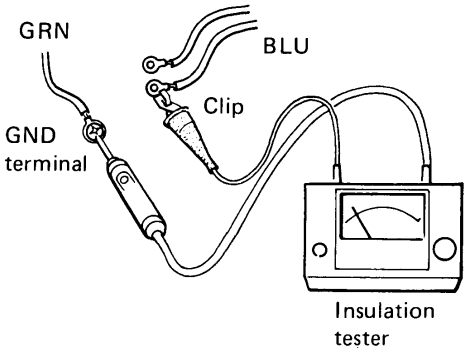

Fig. E-4

ELC-4. Checking of the outdoor fan motor

Remove the blue (BLU) lead wire from the terminal ①, then brown (BRN) and pink (PNK) lead wires from the fan motor capacitor respectively as indicated in the wiring diagram (Fig. E-5)

Set the resistance measuring range of the multimeter to "X1Ω" and measure the resistance between the fan motor lead wires.

SAP121C

Lead wire color	Coil resistance
BLU – BRN	62 Ω ±10 %
BLU – PNK	59 Ω ±10 %

(Table 1A)

SAP91C

Lead wire color	Coil resistance
BLU – BRN	69 Ω ±10 %
BLU – PNK	104 Ω ±10 %

Note: When ambient temp. is 70°F. (Table 1B)

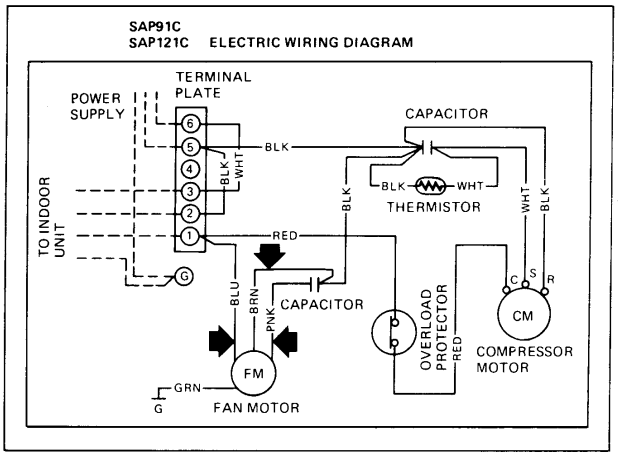

Fig. E-5

ELC-5. Checking of the Motor Capacitor

Checking of any of the indoor fan motor capacitor, outdoor fan motor capacitor and compressor motor capacitor can be done by the same method.

Remove both the lead wire terminals connected to the capacitor, place the probe on the capacitor terminals as shown in the Fig. E-6 and observe the deflection of the pointer, setting the resistance measuring range of the multimeter to the maximum value.

For good condition of the capacitor the pointer bounces to a great extent and then gradually returns to its original position.

The range of deflection and deflection time differ according to the capacity of the capacitor.

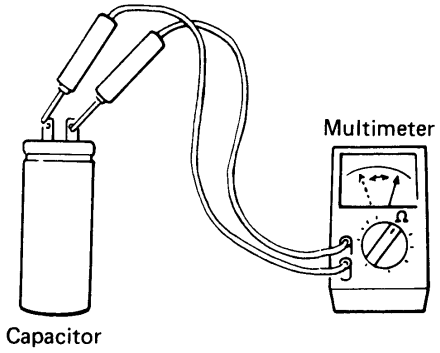

Fig. E-6

ELC-6. Checking of the Compressor Motor Winding

Remove the terminal cover of the compressor motor, set the resistance measuring range of the multimeter to "X1Ω" and check the continuity between each pair out of the 3 terminals as indicated in Fig. E-7.

It is in good working condition if there is continuity among each pair of terminals.

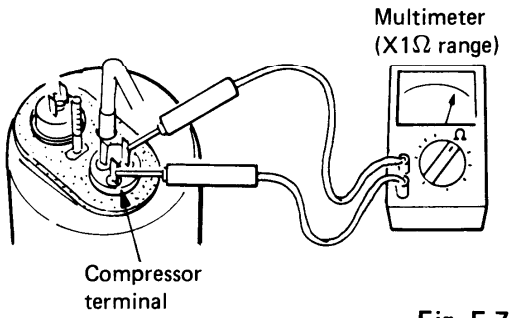

Fig. E-7

ELC-7. Checking of the Remote Control Unit Proper

A. Caution: Use of the Test Switch
(RUN/TEST RUN)
The position of the switch which is used to operate the air conditioner for a room temperature below 70°F (21°C) is the position of the switch for this TEST RUN.

If this operation is continued for a long time, there would be a bad effect on the air conditioner because of over-cooling. Therefore, use this switch only for checking, and in any case, **DO NOT KEEP ON COOLING FOR MORE THAN 15 MIN. UNDER TEST RUN MODE.**

When the checking is over, **TURN THE SWITCH BACK TO ITS ORIGINAL POSITION (= RUN) WITHOUT FAIL.**

B. Checking of the Items of the Remote Control Unit

At first, pull out the connector (11P) of the remote control unit from the controller PCB of the unit (refer to Fig. E-9).

(1) Checking of the Room Temperature Sensor
Measure the resistance between No. 1 and No. 2 connector.

NOTE:
If the probe does not enter the pole because the hole is too narrow then use a probe with a thinner pin.

(For an ambient temperature of 80°F, the resistance is about 5 kΩ).

(2) Fan Speed Selector
Check the continuity of the connector No. 5 and No. 6 against No. 8 (place the negative (−) probe on No. 8 and positive (+) probe on No. 5 and then No. 6).

Checking points	Position of the selector			
	High	Med.	Low	Auto
8 – 5	NO	YES	YES	NO
8 – 6	YES	YES	NO	NO

NOTE: YES . . . . . Continuity (Table-2)
NO . . . . . Discontinuity

(3) Checking of the Selector
Check the continuity of the connectors No. 5, 4 and 3 against connector No. 9.

Connector No.	Position of the Selector				
	MANUAL	ENERGY SAVER	NIGHT SETBACK	TIMER	
				ON	OFF
9 – 5	NO	NO	NO	YES	NO
9 – 4	NO	NO	YES	YES	YES
9 – 3	NO	YES	YES	NO	NO

(Table-3)

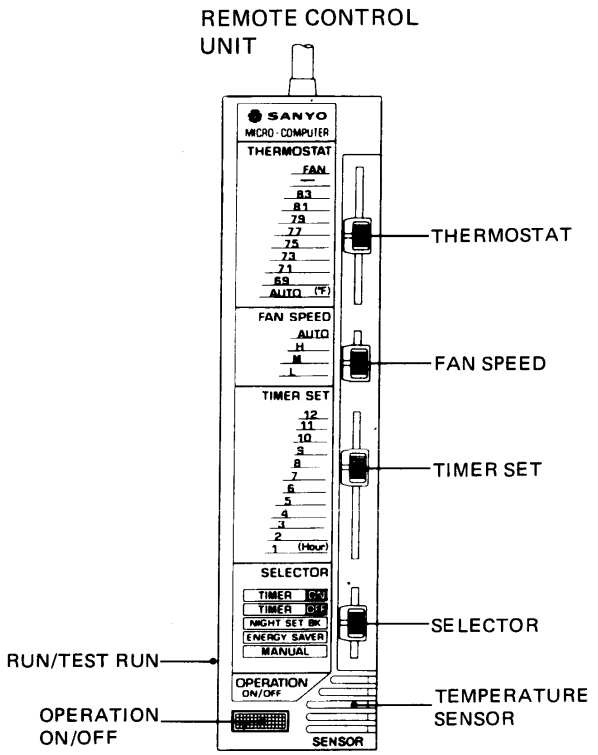

Fig. E-8

4

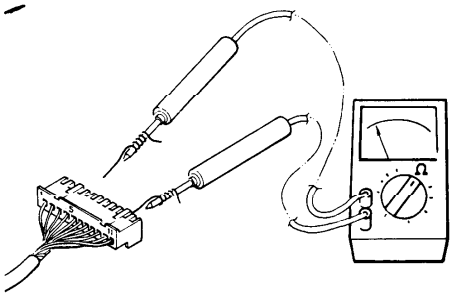

Fig. E-9

(4) Checking of the Operation Pushbutton

The operating switch is in good working condition if there is continuity between No. 9 (placing the negative (−) prove and No. 6 (placing probe) while the pushbutton is pressed.

(5) Checking of the Timer

Measure the continuity between No. 6, 5, 4, 3, and No. 10 (placing the negative (−) probe).

Connector No.	Position of the Selector											
	1	2	3	4	5	6	7	8	9	10	11	12
10 – 6	–	–	–	–	–	–	–	–	Y	Y	Y	Y
10 – 5	–	–	–	–	Y	Y	Y	Y	Y	Y	Y	Y
10 – 4	–	–	Y	Y	Y	Y	–	–	–	–	Y	Y
10 – 3	–	Y	Y	–	–	Y	Y	–	–	Y	Y	–

Y for YES = There is continuity. (Table-4)

(6) Checking of the Thermostat

Measure the continuity between No. 6, 5, 4, 3, and No. 11 (placing the negative (−) probe).

Connector No.	Position of the Selector										
	AUTO	69	71	73	75	77	79	81	83	■	FAN
11 – 6	–	–	–	–	–	Y	Y	Y	Y	Y	Y
11 – 5	–	Y	Y	Y	Y	Y	Y	Y	Y	–	–
11 – 4	–	Y	Y	–	–	–	–	Y	Y	Y	–
11 – 3	–	–	Y	Y	–	–	Y	Y	–	–	–

Y for YES = There is continuity. (Table-5)

If there is abnormality during checking at any of the above step from (1) to (6), replace the remote control unit as it is.

CAUTION:

Do not disassemble the Remote Control Unit.

It is supplied as a complete assembly and is carefully adjusted in the factory by skillful workmanship. Inexperienced disassembly will cause trouble and malfunction in the unit.

ELC-8. Checking of the Continuity of Fuse on Controller PCB

Check the continuity by the multimeter as shown in Fig. E-10.

If it is difficult to check in this way, remove the lamp board ass'y connector and then check it.

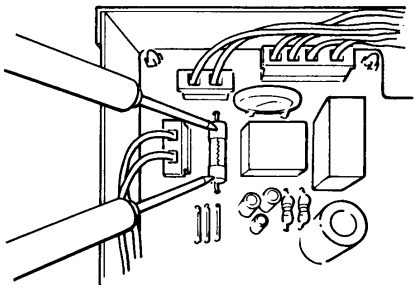

Fig. E-10

ELC-9. Method to Replace Fuse on Controller PCB

1. Remove the controller PCB according to Disassembly Procedure 6-3 (Page 67).
2. Pull out the fuse at the metal clasp by a pair of pliers while heating the soldered leads on the back side of the controller PCB with a sodering iron (30W or 60W). Fig. E-11.
3. Remove the fuse ends one by one. For replacement, insert a fuse of the same rating* and solder it.
   (Allow time to radiate heat during soldering so that the fuse does not melt).

   * Fuse: 124V, 3A (UL-listed No. E39265)
   Parts Code. 4 2059 561 52

CAUTION: Be sure to replace the varistor** adjacent to the fuse either when the fuse is blown.

** Varistor: Cat. No. TSCR3A-UL (UL Recognized)
Parts Code. 4 2349 561 72

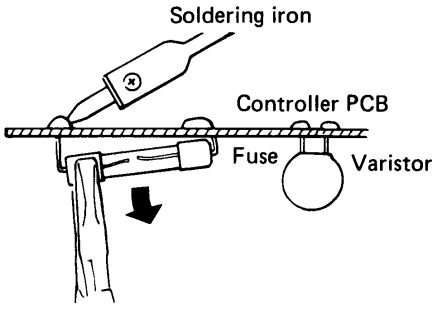

Fig. E-11

ELC-10. Checking of the Output of Controller for Fan Motor Terminals

Take out the fan motor connector from controller PCB and be sure that there is no danger of short circuit in other parts before supplying electricity to the unit. Then put the operation switch to ON and set the selector to MANUAL.

Now measure the voltage between these pins by the multimeter. The controller PCB is in good working condition if the voltage output becomes same as those shown in the right table.

Pair of Pins	FAN		
	Low	Med.	High
4 – 1	115V	0	0
4 – 2	0	115V	0
4 – 3	0	0	115V

Table-6

ELC-11. Checking of the Power Transformer

1. Remove connectors TRANS-1 and TRANS-2 from the controller PCB.
2. Set the resistance measuring range of multimeter to "X1Ω" and measure the resistance of the lead wires between WHT - WHT and BRN - BRN as shown in Fig. E-12.

   It will be completely satisfactory if all the measured values agree with those indicated in Table-7.

Lead wires	Value of resistance
WHT – WHT	About 36.5 Ω
BRN – BRN	About 1.15 Ω

(Table-7)

Note: Ambient room temp. . . . . 70°F

ELC-12. Checking of the indoor Fan Motor

Remove the fan motor connector FM from controller PCB and measure the resistance between each lead wires of the fan motor connector setting the resistance measuring range to "X1Ω".
The motor is in very good working condition if all the values agree with those indicated in Tables-7A and -7B.

SAP121K

Lead wires	Value of resistance
BLU – GRY	About 100 Ω
BLU – VLT	30 Ω
VLT – YEL	16 Ω
YEL – PNK	92 Ω

Table-7A

ELC-13. Checking of the PTC thermistor*

* PTC thermistor is located in the electrical component box of the outdoor unit.

Remove both lead wire terminals connected to the PTC thermistor, set the resistance measuring range of the multimeter to "X1Ω" and check the continuity between terminals of the PTC thermistor as shown in Fig. E-13.

It is normal when a value of 47 Ω is shown at an ambient temperature of 77°F.

ELC-14. Checking of the Compressor Overload Relay

Remove both lead wire terminals connected to the compressor overload relay. Set the resistance measuring range of the multimeter to "X1Ω" and check the continuity between terminals of the overload relay. The overload relay is normal if there is a continuity.

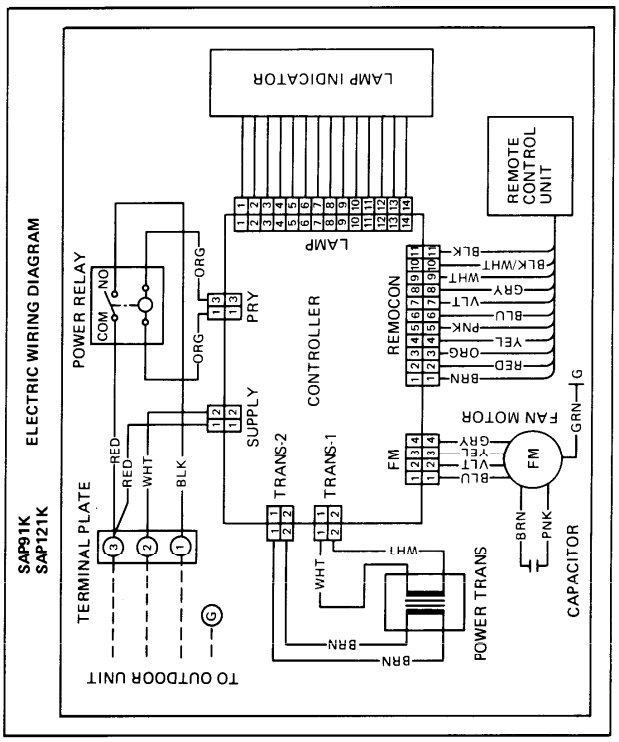

Fig. E-12

SAP91K

Lead wires	Value of resistance
BLU – GRY	About 137 Ω
BLU – VLT	63 Ω
VLT – YEL	25 Ω
YEL – PNK	160 Ω

Table-7B

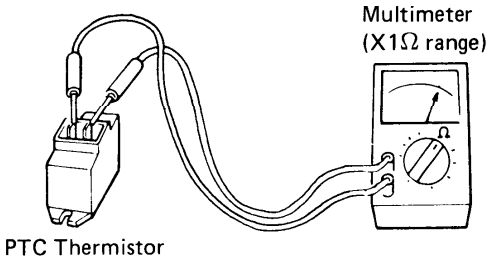

Fig. E-13

ELH-1. Measurement of Insulation Resistance of the Power Cord

Clamp the ground (GND) line of the Power Cord with a lead clip of the insulation resistance tester and measure the resistance by placing a probe on either of the two power lines.

Then also measure the resistance between the GND line and the other power line. The insulation is in good condition if the resistance exceeds 1 MΩ.

Then also measure the resistance between the ground and other power terminals. The insulation is in good condition if the resistance exceeds 1 MΩ (Fig. E-1H).

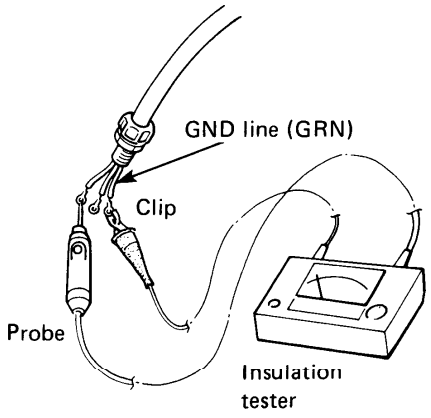

Fig. E-1H

ELH-2. Measurement of Insulation Resistance of the compressor

Remove the black lead wire connected to the compressor motor from (8) on the terminal base. Clamp the removed black lead wire with a lead clip of the insulation resistance tester and measure the resistance by placing a probe of the tester to the terminal GND to which green lead wire is connected.

The insulation is in good condition if the resistance exceeds 1 MΩ (Fig. E-2H).

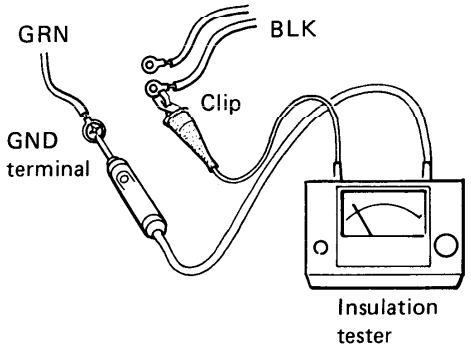

Fig. E-2H

ELH-3. Measurement of Insulation Resistance of the Fan Motor

3.1. In case of indoor fan motor

Remove the fan motor connector from controller PCB (P54, Fig. E-B). Clamp the green lead wire (at the bear section) extended from the terminal GND in the electrical component box and measure insulation resistance by placing a probe of the insulation tester to either pole of this connector.

The insulation is in good condition if the resistance exceeds 1 MΩ. Fig. E-3H.

Note:
If the probe does not enter the pole because the hole is too narrow then use a probe with a thinner pin.

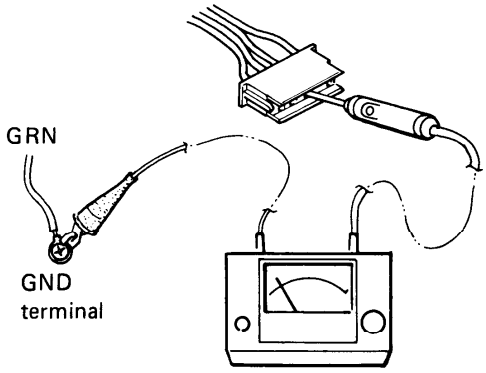

Fig. E-3H

3.2. In case of outdoor fan motor

Remove the black lead wire of the fan motor from (4) on the terminal base. Clamp this lead wire with a lead clip of the insulation resistance tester and measure the resistance by placing a probe of the tester to the terminal GND.

The insulation is in good condition if the resistance exceeds 1 MΩ. Fig. E-4H

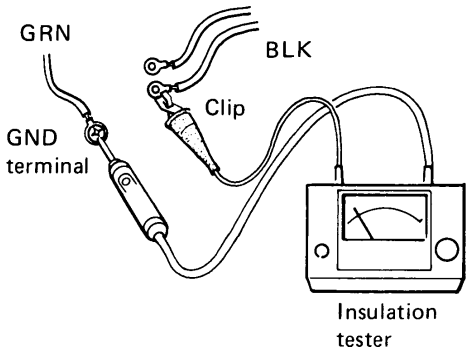

Fig. E-4H

ELH-4. Checking of the outdoor fan motor

Remove the blue (BLU) lead wire from the terminal ③, then brown (BRN) and pink (PNK) lead wires from the fan motor capacitor respectively as indicated in the wiring diagram (Fig. E-5H).

Set the resistance measuring range of the multimeter to "X1Ω" and measure the resistance between the fan motor lead wires.

Lead wire color	Coil resistance
BLU – BRN	69 Ω±10 %
BLU – PNK	104 Ω±10 %

(Table-1H)

Note: When ambient temp. is 70°F.

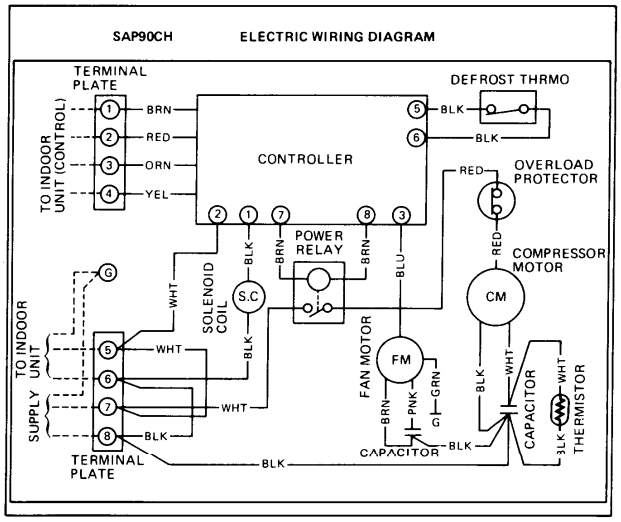

Fig. E-5H

ELH-5. Checking of the Motor Capacitor

Checking of any of the indoor fan motor capacitor, outdoor fan motor capacitor and compressor motor capacitor can be done by the same method.

Remove both the lead wire terminals connected to the capacitor, place the probe on the capacitor terminals as shown in the Fig. E-6H and observe the deflection of the pointer, setting the resistance measuring range of the multimeter to the maximum value.

For good condition of the capacitor, the pointer bounces to a great extent and then gradually returns to its original position.

The range of deflection and deflection time differ according to the capacity of the capacitor.

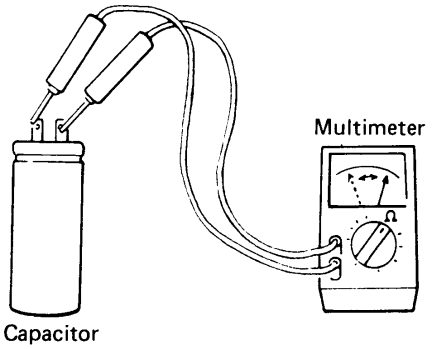

Fig. E-6H

ELH-6. Checking of the Compressor Motor Winding

Remove the terminal cover of the compressor motor, set the resistance measuring range of the multimeter to "X1Ω" and check the continuity between each pair out of the 3 terminals as indicated in Fig. E-7H.

It is in good working condition if there is continuity among each pair of terminals.

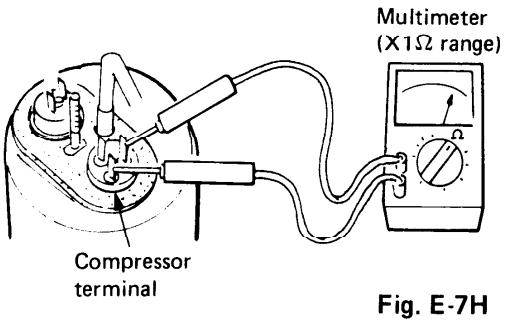

Fig. E-7H

ELH-7. Checking of the Remote Control Unit Proper

A. Caution: Use of the Test Switch
(RUN/TEST RUN)

The position of the switch which is used to operate the air conditioner for a room temperature below 70°F (21°C) is the position of the switch for this TEST RUN.

If this operation is continued for a long time, there would be a bad effect on the air conditioner because of over-cooling. Therefore, use this switch only for checking, and in any case, **DO NOT KEEP ON COOLING FOR MORE THAN 15 MIN. UNDER TEST RUN MODE.**

When the checking is over, **TURN THE SWITCH BACK TO ITS ORIGINAL POSITION (= RUN) WITHOUT FAIL.**

B. Checking of the Items of the Remote Control Unit

At first, pull out the connector (11P) of the remote control unit from the controller PCB of the unit (refer to Fig. E-9).

(1) Checking of the Room Temperature Sensor
Measure the resistance between No. 1 and No. 2 connectors.

NOTE:
If the probe does not enter the pole because the hole is too narrow then use a probe with a thinner pin.

(For an ambient temperature of 80°F, the resistance is about 5 kΩ).

(2) Fan Speed Selector
Check the continuity of the connector No. 3 and No. 4 against No. 10 (place the negative (−) probe on No. 10 and positive (+) probe on No. 3 and then No. 4).

Checking points	Position of the selector			
	High	Med.	Low	Auto
10 – 3	NO	YES	YES	NO
10 – 4	YES	YES	NO	NO

NOTE: YES . . . . . Continuity (Table-2H)
NO . . . . . Discontinuity

(3) Checking of the Selector
Check the continuity of the connectors No. 5, 4 and 3 against connector No. 9.

Connector No.	Position of the Selector				
	MANUAL	ENERGY SAVER	NIGHT SETBACK	TIMER	
				ON	OFF
9 – 3	NO	NO	NO	YES	NO
9 – 1	NO	NO	YES	YES	YES
9 – 2	NO	YES	YES	NO	NO

(Table-3H)

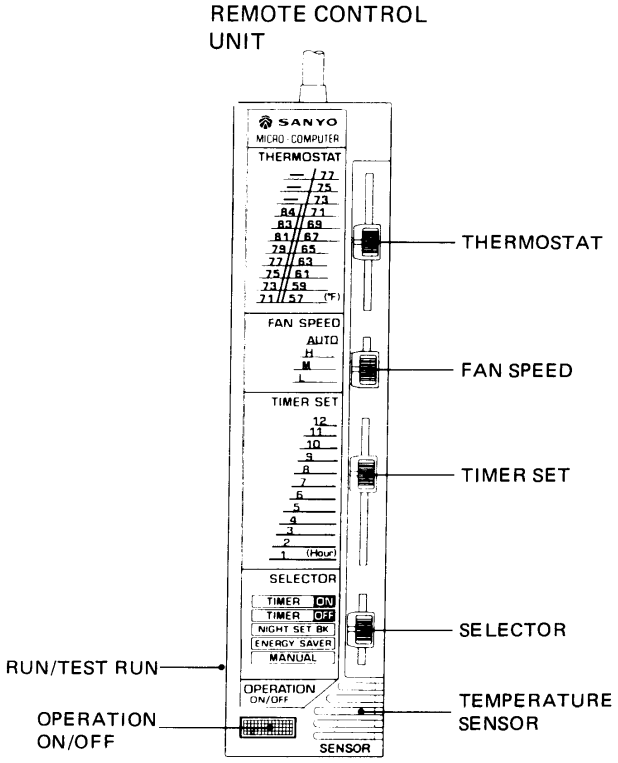

Fig. E-8H

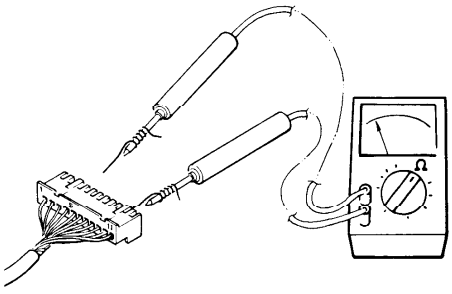

Fig. E-9H

(4) Checking of the Operation Pushbutton

The operating switch is in good working condition if there is continuity between No. 9 (placing the negative (–) prove and No. 4 (placing positive (+) probe) while the pushbutton is pressed.

(5) Checking of the Timer

Measure the continuity between No. 4, 3, 1, 2 and No. 8 (placing the negative (–) probe).

Connector No.	Position of the Selector											
	1	2	3	4	5	6	7	8	9	10	11	12
8 – 4	–	–	–	–	–	–	–	–	Y	Y	Y	Y
8 – 3	–	–	–	–	Y	Y	Y	Y	Y	Y	Y	Y
8 – 1	–	–	Y	Y	Y	Y	–	–	–	–	Y	Y
8 – 2	–	Y	Y	–	–	Y	Y	–	–	Y	Y	–

Y for YES = There is continuity. (Table-4H)

(6) Checking of the Thermostat

Measure the continuity between No. 4, 3, 1, 2 and No. 7 (placing the negative (–) probe).

Connector No.	Posistion of the Selector										
	71	73	75	77	79	81	83	84	▬	▬	▬
7 – 4	–	–	–	–	Y	Y	Y	Y	Y	Y	Y
7 – 3	Y	Y	Y	Y	Y	Y	Y	Y	–	–	–
7 – 1	Y	Y	–	–	–	–	Y	Y	Y	Y	–
7 – 2	–	Y	Y	–	–	Y	Y	–	–	Y	Y

Y for YES = There is continuity. (Table-5H)

If there is abnormality during checking at any of the above step from (1) to (6), replace the remote control unit as it is.

CAUTION:
Do not disassemble the Remote Control Unit.
It is supplied as a complete assembly and is carefully adjusted in the factory by skillful workmanship. Inexperienced disassembly will cause trouble and malfunction in the unit.

ELH-8. Checking of the Continuity of Fuse on Controller PCB

Check the continuity by the multimeter as shown in Fig. E-10H.

If it is difficult to check in this way, remove the lamp board ass'y connector and then check it.

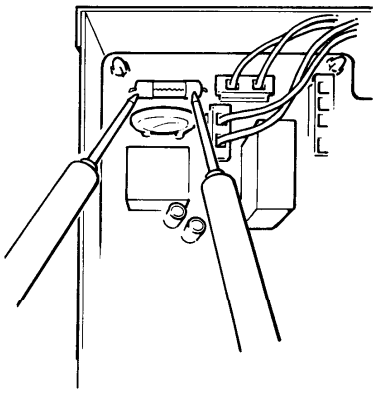

Fig. E-10H

ELH-9. Method to Replace Fuse on Controller PCB

1. Remove the controller PCB according to Disassembly Procedure 6-3 (Page 67).
2. Pull out the fuse at the metal clasp by a pair of pliers while heating the soldered leads on the back side of the controller PCB with a soldering iron (30W or 60W). Fig. E-11H.
3. Remove the fuse ends one by one. For replacement, insert a fuse of the same rating* and solder it. (Allow time to radiate heat during soldering so that the fuse does not melt).

* Fuse: 125V, 3A (UL-listed No. E39265)
Parts Code. 4 2059 561 52

CAUTION : Be sure to replace the varistor** adjacent to the fuse either when the fuse is blown.

** Varistor: Cat. No. TSCR3A-UL (UL Recognized)
Parts Code. 4 2349 561 72

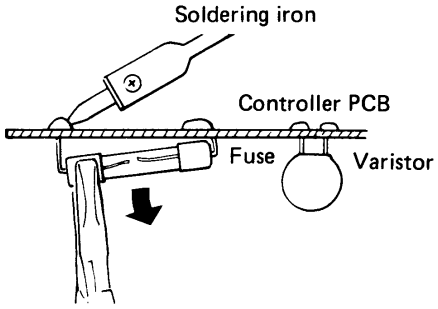

Fig. E-11H

ELH-10. Checking of the Output of Controller for Fan Motor Terminals

Take out the fan motor connector from controller PCB and be sure that there is no danger of short circuit in other parts before supplying electricity to the unit. Then put the operation switch to ON and set the selector to MANUAL.

Now measure the voltage between these pins by the multimeter. The controller PCB is in good working condition if the voltage output becomes same as those shown in the right table.

Pair of Pins	FAN		
	Low	Med.	High
4 – 1	115V	0	0
4 – 2	0	115V	0
4 – 3	0	0	115V

Table-6H

4

ELH-11. Checking of the Power Transformer

1. Remove connectors TRANS-1 and TRANS-2 from controller PCB.
2. Set the resistance measuring range of multimeter to "X1Ω" and measure the resistance of the lead wires between WHT - WHT and BRN - BRN as shown in Fig. E-12H.

   It will be completely satisfactory if all the measured values agree with those indicated in Table-7H.

Lead wires	Value of resistance
WHT – WHT	About About 36.5 Ω
BRN – BRN	About About 1.15 Ω

Table-7H

Note: Ambient room temp. . . . . 70°F

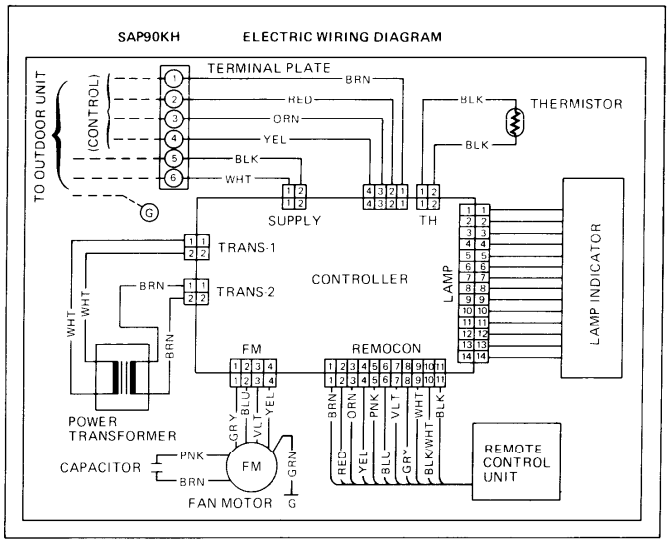

Fig. E-12H

ELH-12. Checking of the indoor Fan Motor

Remove the fan motor connector FM from controller PCB and measure the resistance between each lead wires of the fan motor connector setting the resistance measuring range to "X1Ω".
The motor is in very good working condition if all the values agree with those indicated in Table-7H.

Lead wires	Value of resistance
BLU – GRY	About 137 Ω
BLU – VLT	63 Ω
VLT – YEL	28 Ω
YEL – PNK	160 Ω

(Table-7H)

ELH-13. Checking of the PTC thermistor*

* PTC thermistor is located in the electrical component box of the outdoor unit.

Remove both lead wire terminals connected to the PTC thermistor, set the resistance measuring range of the multimeter to "X1Ω" and check the continuity betwen terminals of the PTC thermistor as shown in Fig. E-13H.

It is normal when a value of 47 Ω is shown at an ambient temperature of 77°F.

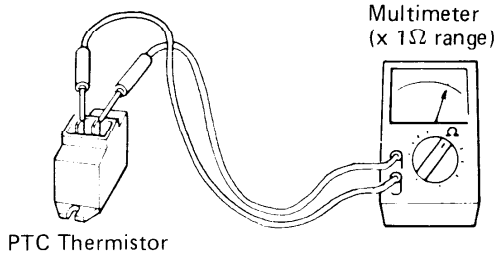

Fig. E-13H

ELH-14. Checking of the Compressor Overload Realy

Remove both lead wire terminals connected to the compressor overload relay. Set the resistance measuring range of the multimeter to "X1Ω" and check the continuity between terminals of the overload relay. The overload relay is normal if there is a continuity.

SANYO

7. DISASSEMBLY AND SERVICE PROCEDURES

— Quick Access Index —

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5

INDOOR UNIT

7-1. Casing – Removal

1) Remove the two (2)* set screws holding the casing to the indoor unit with a Phillips screwdriver. *SAP 121KC has three (3) screws.

2) Pull up the casing by hand, press down on tabs on top, then withdraw the casing by pulling it back straight. Fig. D-1.

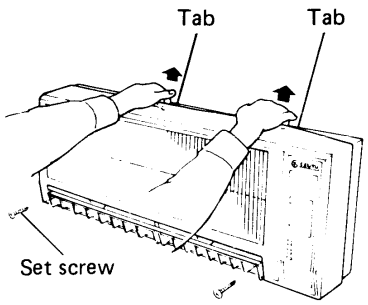


Fig. D-1

7-2. Electrical Component Box – Access and Removal

1) Remove casing.

2) Using a Phillips screwdriver, remove set screw (A) on the indicator lamp board ass'y. Fig. D-2.

3) To remove the indicator lamp board ass'y on the PCB, push the connector socket downwards slightly and pull it toward you.

CAUTION : Connector pins are thin and delicate, therefore never apply excessive force when disconnecting the socket.

4) Disengage the electrical component box by the following procedure
   a) Remove screw (B) and the cover plate.

CAUTION : Before accessing inside the electrical component box, be sure to check that power to the unit is disconnected.

   b) Disconnect interunit wires from the terminal block.
   c) Remove screws (C1) , (C2) and the grounding screw respectively. Fig. D-2.

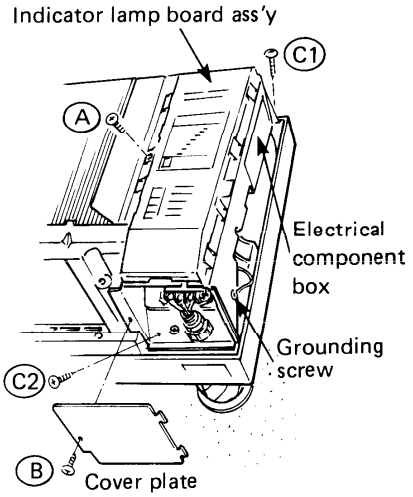


Fig. D-2

7-3. Controller PCB – Removal

1) Disengage the electrical component box from the chassis.

2) Loosen screws (D1) , (D2) and remove the mounting plate. Fig. D-3.

3) Withdraw all of the connector or socket connected to the pins on the controller PCB. Cut wire ties, if necessary. Refer to Page 54 on connector identification.

4) Pinch a white plastic spacer at the corner of the controller PCB with a pliers and pull the PCB up.
   There are four spacers at the corners; repeat at the other three spacers. Fig. D-4.

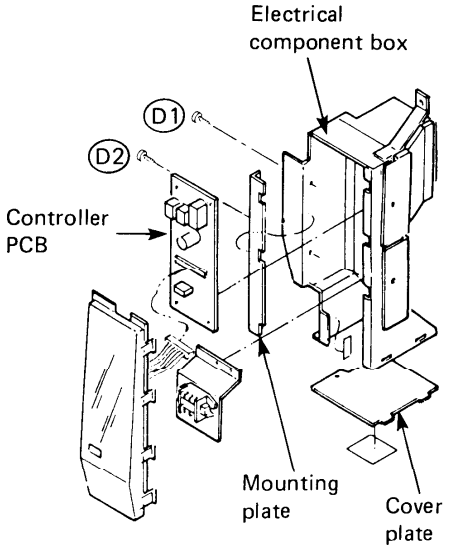


Fig. D-3

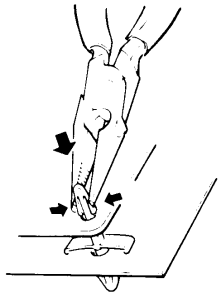


Fig. D-4

7-4. Evaporator (= Indoor Heat Exchanger) – Removal

1) Remove the electrical component box.

2) Loosen the fixing screws of the evaporator mounting plates (A) and fan motor mounting plate (B) , and remove them respectively. Fig. D-5.

3) Lift up the evaporator with both hands, then withdraw the evaporator together with the piping. (If the piping is fixed with a clamper or saddle, first remove the clamp.)

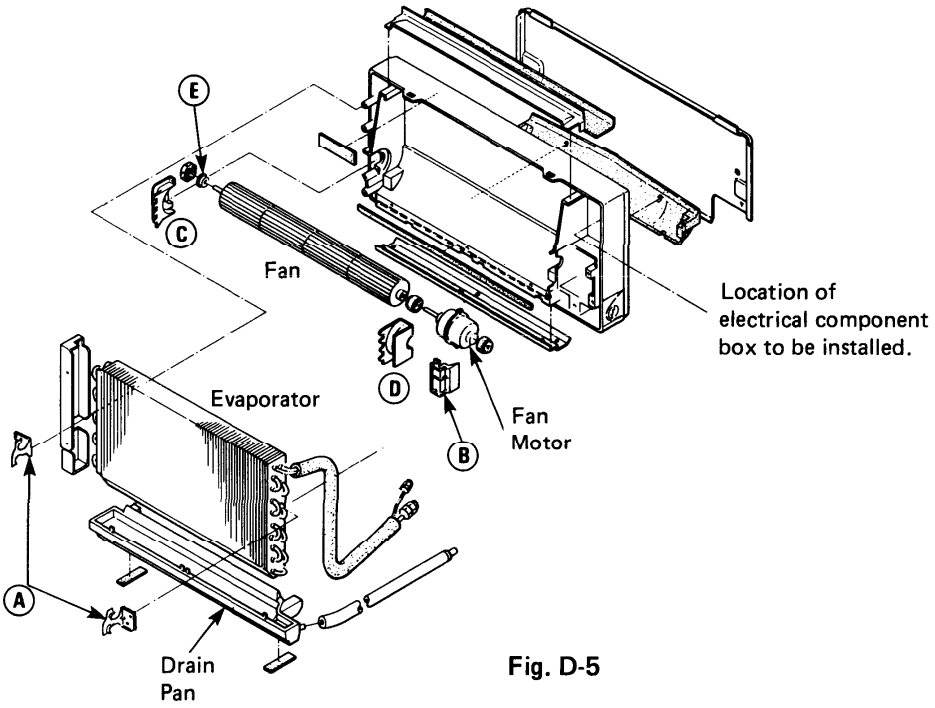


Fig. D-5

7-5. Fan and Fan Motor – Removal

1) As shown in Figs. D-6 and D-7, loosen the screws of the plastic mounting plates (C) and (D) which secure the fan, using a Phillips screwdriver, then remove the fan and fan motor.

2) When withdrawing the fan from the motor, first loosen the fan fixing bolts using a hexagonal key (Fig. D-8).

3) Withdraw the Bearing Ass'y (E) retaining the left side of the fan, by hand, then pull the fan to the left and withdraw it from the motor shaft. Fig. D-5.

4) Remove the fan motor by loosening the two fixing screws using a Phillips screwdriver.

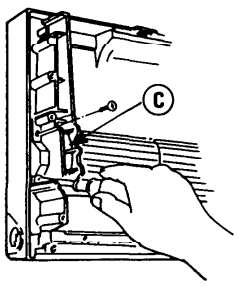


Fig. D-6

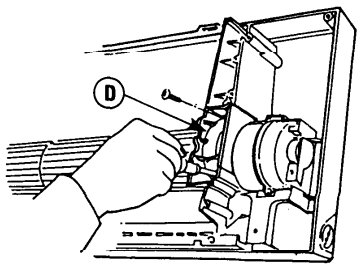


Fig. D-7

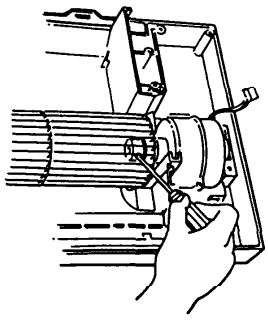


Fig. D-8

OUTDOOR UNIT

7-6. Cabinet – Removal

Remove the cabinet by removing 12 fixing screws using a Phillips screwdriver. Fig. D-9.

Note: When working only on the wiring, it is possible to gain access to the wiring terminals by simply removing the Access Panel "C". Fig. D-10.

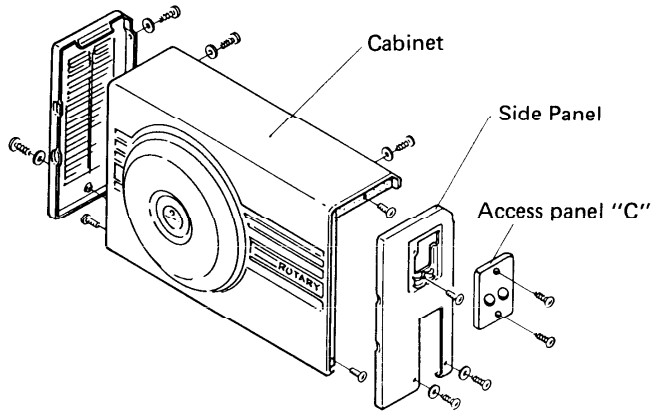


Fig. D-9

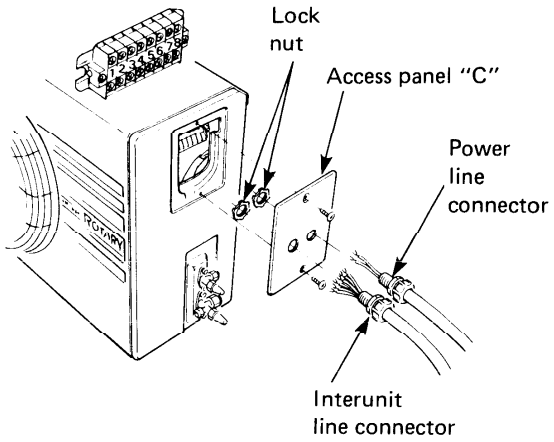


Fig. D-10

7-7. Fan and Fan Motor – Removal

1) Remove the fan by removing the propeller fan fixing screw using a straight blade screwdriver. Refer to Fig. D-11.

2) Using a pincher, cut the plastic wire ties fixing the fan motor lead wires connected to fan motor capacitor or other terminals.

3) Using a Phillips screwdriver, remove the three fixing screws of the fan motor, then withdraw the fan motor.

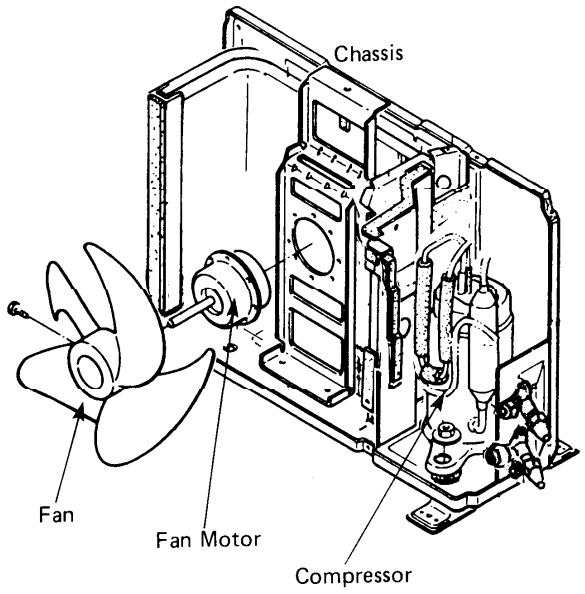


Fig. D-11

7-8. Compressor Replacement

7-8-1. Tool List for Compressor Replacement

No.	Item	Q'ty	Remarks
1	Portable fire extinguisher	1	
2	Oxy-acetylene torch set	1	Prest-O-Lite Portable Outfit or equivalent
3	Torch lighter	1	
4	Oxweld goggles	1	
5	Brazing flux	1	
6	Soldering rod	1	
7	Vacuum pump (Capacity: 2 ~ 3 Cu-ft./min.)	1	Robinair or equivalent
8	Nitrogen gas (in 10 lb. container)	1	
9	Refrigerant R22 (in 10 lb. container)	1	
10	Refrigerant charging cylinder (5 lb. or more)	1	
11	System analyzer valve set	1	Robinair, Inperial or equivalent "Robbi" thermistor vacuum gauge or equivalent
12	Vacuum gauge (Range 0 – 1000 microns)	1	
13	Charging hose W/ 1/4" fittings	5	
14	Charge fitting 1/4"	1	
15	Tube adapter 1/4"	1	
16	Pinch-off tool	1	
17	Diagonal cutting plier	1	
18	Long-nose side cutting plier	1	
19	Slip-joint plier	1	
20	Torque wrench (340 lb.)	1	
21	Pipe cutter	1	Imperial or Rigid
22	Flaring tool	1	Rigid or equivalent
23	Swaging tool	1	
24	Combination file set	1	
25	Regular screwdriver 8"	1	
26	Phillips screwdriver 6"	1	
27	Adjustable wrench 10"	1	
28	Adjustable wrench 12 "	1	
29	Hex. nut driver (6mm)	1	(For compressor bolt)
30	Oil pan	1	
31	Liquid soap with a brush	1	
32	Clean moist cloth	1	

7-8-2. Safety Precautions

1. Make sure unit is disconnected from the power source while it is being assembled or disassembled for servicing.
2. Wear protective goggles at any time when brazing or unbrazing.
3. Be sure to confirm system is at atmospheric pressure before using torch.
4. When brazing or unbrazing pipes, never locate face or any other parts of the human body in direct line with the pipe opening.
5. Before commensing the trial run, be sure the unit is correctly wired and is grounded adequately when it is connected to the power.

7-8-3. Compressor Replacement Procedures (all models)

A. Separating the Outdoor Unit

In case the compressor malfunctions with a split type air conditioner under normal conditions, release the refrigerant gas at the location first and remove the piping, then separate the outdoor unit. Pay special attention to ventilation if the place of installation is small.

1) Make sure that the power is definitely turned OFF and remove the Access Panel "C" of the outdoor unit with power line and inter-unit line connectors. Remove wires from terminals within the electrical component box and wrap the ends of the wires separately with the insulating tape.

2) Place an oil pan at the under side of the service valves. Then remove the caps of the wide pipe service valve and narrow pipe service valve with an adjustable wrench.

3) Leave the wide pipe service valve fully close by turning the spindle of the valve clockwise with a valve key or ratchet wrench. Close the narrow pipe service valve in the same manner.

4) Apply two pairs of adjustable wrenches to the union of the wide pipe service valve, then disconnect piping from the outdoor unit.

5) Use an adjustable wrench and a torque wrench (130 ~ 170 lbs. in.), and disconnect narrow pipe from the outdoor unit.

   The refrigerant gas will seep out from the indoor unit as well as the piping.

6) Seal the ends of the piping so that no moisture or dust to enter.

7) Gradually open the narrow pipe service valve and release the remaining refrigerant.

8) Open the wide pipe service valve and release the remaining refrigerant.

9) Finally leave the wide pipe service valve and narrow pipe service valve fully open.

10) Clean the oil that has spread around the periphery.

11) Keep the separated outdoor unit in an upright position and carry it to the service station.

B. Removing the Old Compressor

CAUTION:
Always wear welder's goggles when heating the piping with a torch and make sure not to get too close to the opening of the piping. Furthermore, pay special attention to the position of the torch flame so as not to burn the compressor terminals.

1) The outdoor unit carried into the service shop may have some refrigerant gas remaining within it. Therefore, make sure that both wide pipe service valve and narrow pipe service valve are fully open.

2) Remove the cabinet according to the disassembly procedure of the outdoor unit. Refer to Page 69.
Furthermore remove the terminal cover at the top of the compressor and remove the wiring of the overload relay and the compressor terminal. Fig. D-13.

3) Set aside an Oxy-Acetylene torch which is needed for removing the piping of the compressor.

4) Confirm that system has reached atmospheric pressure.

5) With an Oxy-Acetlyine torch apply heat uniformly and unbraze the joints of upper section of the Liquid Injection Capillary tube to the compressor, the upper section of the accumulator and the upper section of the compressor discharge pipe respectively, and pull them free with pliers. Fig. D-12 shows unbrazing points with arrows.

* Be sure to save all mounting components with the replacement compressor for future use.

6) To remove the compressor, raise it straight and disengage from the base unit.

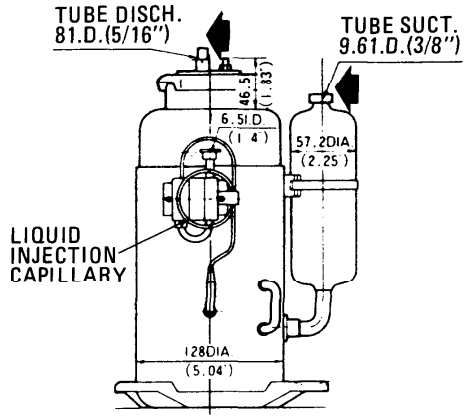


Fig. D-12

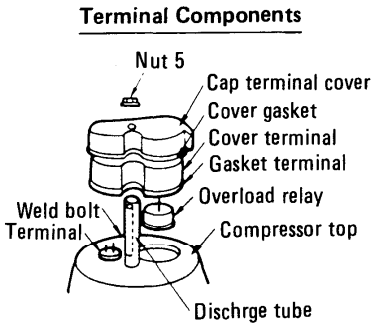


Fig. D-13

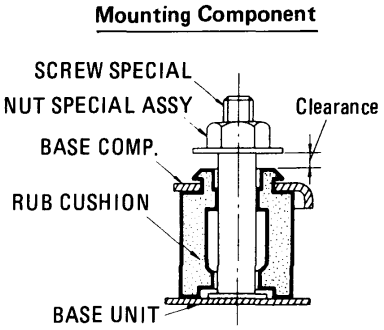


Fig. D-14

5

IMPORTANT NOTICE

Before installing the new compressor, check for possible system contamination by the following procedure:

- Place about 10 cc of the oil from the old compressor into a transparent container and visually check the degree of oil contamination. If the oil has a slight burnt odor but no color change or residue, and ordinary compressor replacement accoring to the instructions below may be carried out.
- If the oil has a burnt pungent odor and shows contamination (dark color with tiny particles of metal) the system must be cleaned sufficiently with a suction filter or a drier-strainer and then replace the oil drier with a new one.
- However, if just the compressor is replaced without sufficient system cleaning, contaminated oil may cause the buring of the compressor again.
- If the oil compressor is to be scrapped, by pinching the terminal section with a pair of pliers, there should not be any chance of it being mistakenly used.

C. Installing a new compressor

1. Make sure that the defective old compressor has been removed and the new compressor to be installed is of the same specification by checking the 8 digit code number on stamped marking on the upper section of the compressor helmet case. (**e.g. : 806421 42**) For the detail of the compressor identification refer to page. 4.

2. Transfer the mounting parts to the new compressor.

3. Nick the end of the pinched suction pipe of the new compressor with a pincher and release the holding charge (Nitrogen: 29 psig).

4. With an Oxy-acetylene torch and pliers, unbraze compressor seals at both discharge port and suction port (upper part of the accumlator).

> **CAUTION** :
> Be careful of the position of the torch so as not to burn the terminals of the compressor when brazing or unbrazing.

5. Install the new compressor in exactly the same manner as the original compressor.
   (* See CAUTION bottom of this page.)

6. Shape both the suction and discharge lines to the approx. area of the compressor fittings and engage each pipe end to the mating compressor fitting.

7. Hold pipings securely with pliers and braze all connections carefully with the torch.

8. Perform leak test evacuation, and charging refrigerant according to procedures described in section 6-9. Page.

CAUTION * If the old compressor was heavily contaminated, be sure to replace strainer (or drier) when replacing the new compressor.

7-9. Leak Test, Evacuation and Charging

7-9-1. Required tools and system set up

No.	Item	Q'ty
1)	Vacuum pump	1
2)	Vacuum gauge	1
3)	System analyzer valve set	1
4)	Charging hose (With 1/4" connector)	6
5)	1/4" Flared tube cross fitting	1
6)	Charging Cylinder	1
7)	1/4" Flared Packless valve (To be used for V3, V4 and V5)	3

* One of conventional system set up and procedure for leak test, evacuation and charging is described in section 6-9 for the reference.

** Robinair or Imperial Portable Charging Station may be used as a convenient packaged tool for the purpose of servising the refrigerant system.

7-9-2. Leak Test in the System

After replacement of the new compressor, the system must be checked for leaks according to the below mentioned procedure:

1) If cylinder has not yet been filled, move at least one pound of refrigerant (R22) to the charging cylinder. Fig. D-15.

2) Prepare the system analyzer valve set and connect charging hoses as in Fig. D-16. Be sure to close all valves before connection.

3) Open fully both Narrow Pipe and Wide Pipe service valves on the outdoor unit.

4) Open valves V1 and V2 on the system analyzer valve set and allow vapor refrigerant entering into the system. Charge about 1/2 pound gas to the system and close V1 and V2, and then close the valve on the charging clyinder.

5) Apply liquid soap at charge hose connectors, discharge and suction pipes, and brazed liquid injection capillary section of the replaced compressor or other connection parts, and check to see change of bubbles. An electronic halogen gas leak detector, of course, may be used for this porpose.

6) When leaks are located, depressurize system and repair leaks.

7) If no leaks, purge the 1/2 pound refrigerant from the system and proceed the system set up for evacuation in section 6-9-3. Refer to page 75.

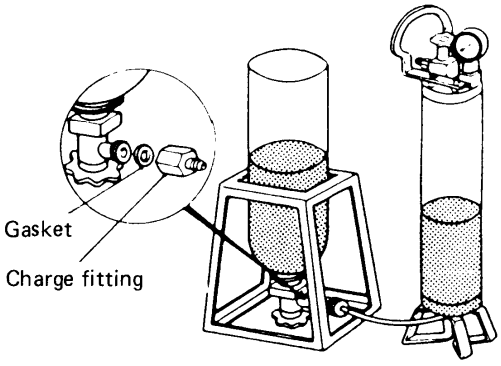


Fig. D-15

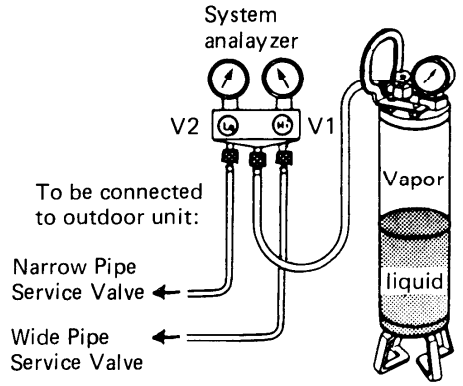


Fig. D-16

7-9-3. Evacuation

1) Connect instrument as in Fig. D-17.

2) Confirm that all connections are made correctly and check all valves are closed.

3) Open V6, V7, V1 and V2 respectively.

4) Open V3 and V5. Never fail to open the shut off valve on the vacuum pump if there is.

5) Run the vacuum pump for evacuation. Required time for complete evacuation differs with capacity of the pump. (Consult shop manual for specifications.)

6) While system is evacuating, utilize this time to fill the charging cylinder, if it is not ready.

7) If vacuum gauge reading has reached 500 microns or less, stop the vacuum pump and close V3.

8) Keep this condition at least 5 minutes and observe the vacuum gauge for change. Fig. D-18.
If pointer on the gauge moves to larger numbers, check system for leaks again accoring to the procedure in section 6-9-2. Page 74.

9) If the indication of the vacuum gauge will not change, system is now prepared for charging refrigerant.

10) Proceed to charging refrigerant in section 6-9-4. Page 76.

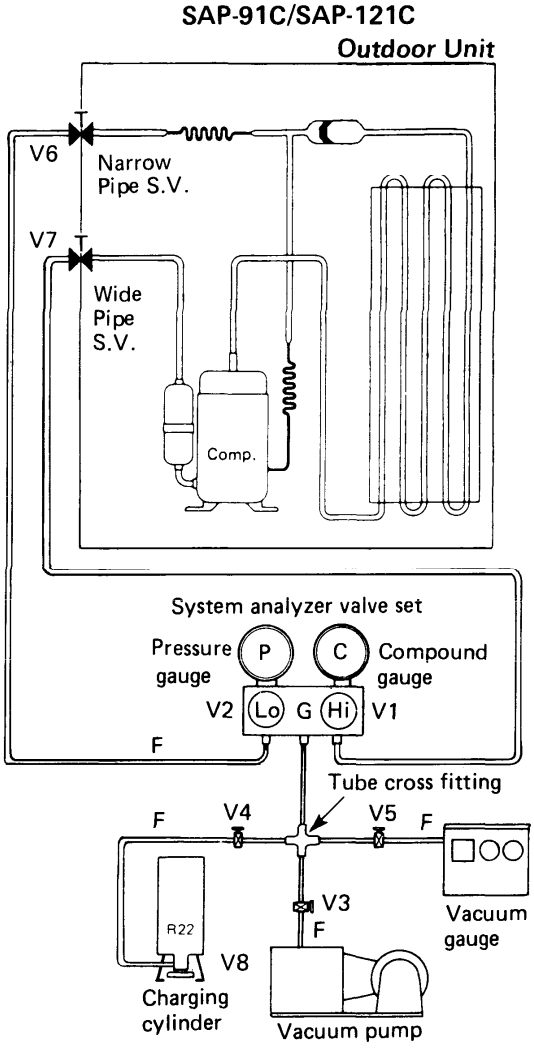


Fig. D-17

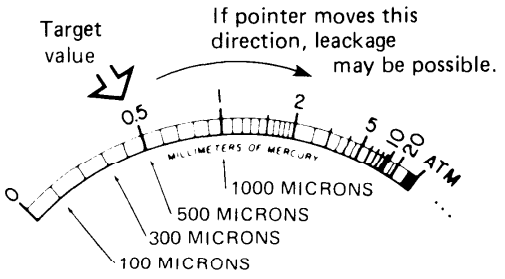


Fig. D-18

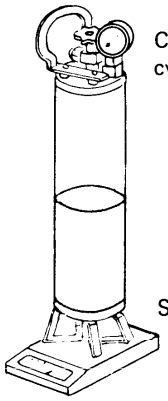
7-9-4. Charging Refrigerant (R22)

• Preparation of Refrigerant

a) Measure the net weight of the charging cylinder before charging refrigerant and memorize it.

b) Refill required amount of refrigerant from the container to the charging cylinder. Be sure to measure the cylinder contents by weighing it. Fig. D-19.

NOTE: Do not confuse the refrigerant gas level graduations on the charging cylinder with the weight. Vapor refrigerant on the upper cylinder part must be taken into consideration.



0.5 lb. plus specified amount given on the name plate of each unit.
See specifications in page. 1.

Fig. D-19

• Charging Procedure

1) Evacuate system according to the procedure in section 6-9-3.

2) Close valves V3, V5, V1, V6 and V7 when evacuation is completed.

3) Open charging cylinder valve at bottom V8 slightly.

4) Loosen hose connection at V4 a little to let air escape from the hose. Then tighten connection again.

5) Open V4 fully to let liquid refrigerant flow in the charging hose through V2.

6) Measure charging cylinder weight to charge exact amount of refrigerant just before opening V6.

7) Open V6 and let liquid refrigerant entering into the system.

8) When full charge has entered system (do not permit liquid level to drop blow "0" (zero) on the graduation of the charging cylinder), close V6 tightly.

9) Close V8 at the bottom of the charging cylinder.

10) Loosen hose connections and let refrigerant escape from hoses.

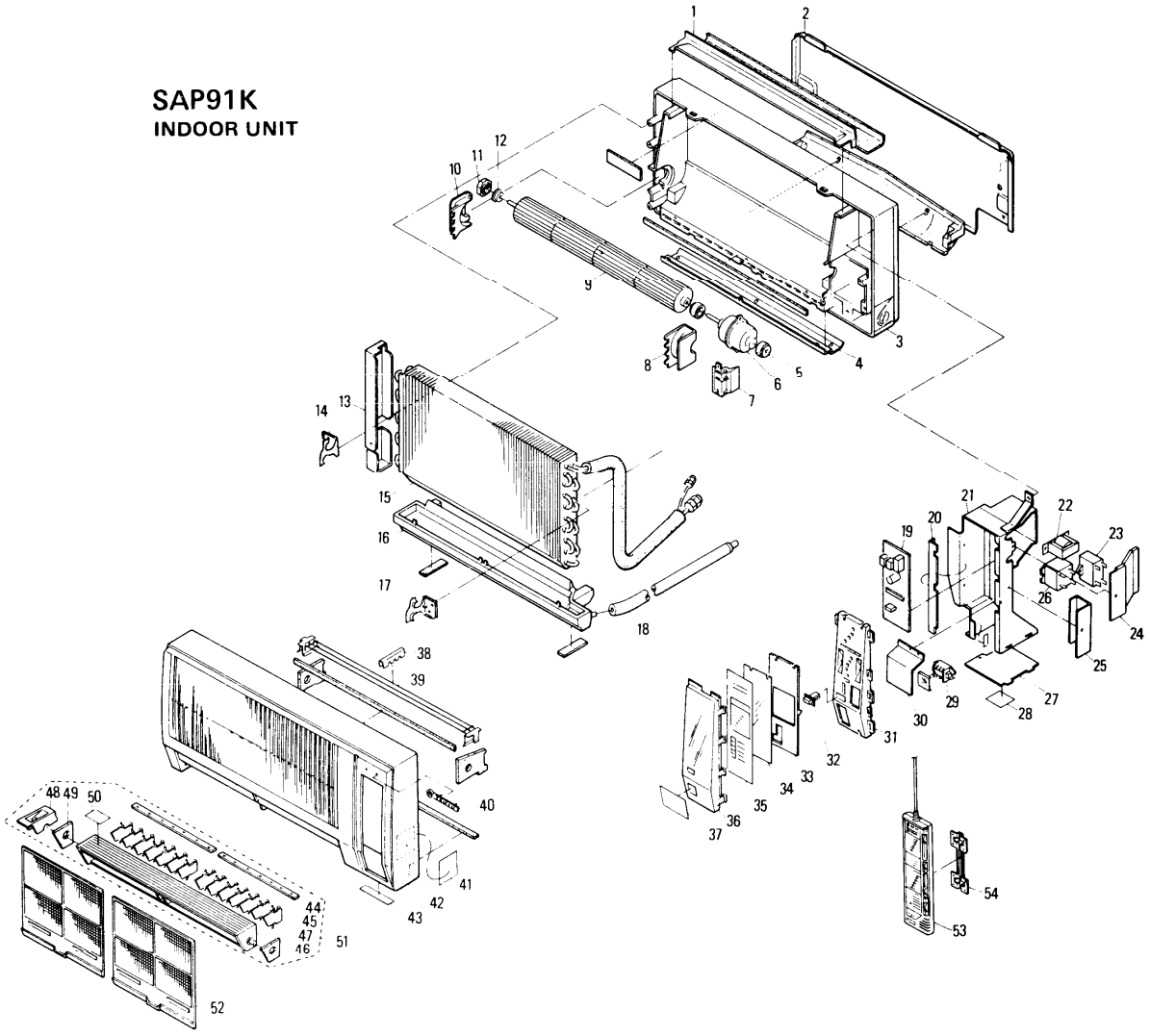
11) Remove hoses, charging cylinder and system analyzer valve set. Now, system charging has completed.

12) Carry out piping between indoor unit and outdoor unit and also do necessary wiring according to the procedure given in the installation instructions in section, and perform trial operation.

8. PARTS LIST (SAP91KC)

MODEL NO.	PRODUCT CODE NO.
SAP91K	85264147
SAP91C	85274085

SAP91K
INDOOR UNIT



■ **Accessories Supplied with Unit for Installation**

Parts	Figure	Q'ty	Code
Anchor		10	852-2-1311-11600
Cover		1	852-2-2369-15200
Cover		1	859-2-1124-10302
Tapping Screw, Truss	(5/8") 4x16mm	6	3-9219-41601
Tapping Screw, Flat	(3/8") 3x10mm	2	3-9222-31001
Full Scale Installation Diagram		1	852-6-4139-60000

Parts	Figure	Q'ty	Code
Insul, Nipple		1	852-2-2414-12400
Cord Clip		2	851-2-5354-00101
Mounting Bracket		1	851-2-5378-00101
Tapping Screw, Pan	(5/8") 4x16mm	2	3-9221-41601
Drain Hose		1	852-2-4204-10901

WM-11609

SAP91KC

SAP91K
INDOOR UNIT

ATTENTION !

To ensure correct parts supply, please let us know followings, when you make service parts order:
1. Part No. 2. Description 3. Q'ty 4. Volts - Hz - Ph 5. PRODUCT MODEL NO.

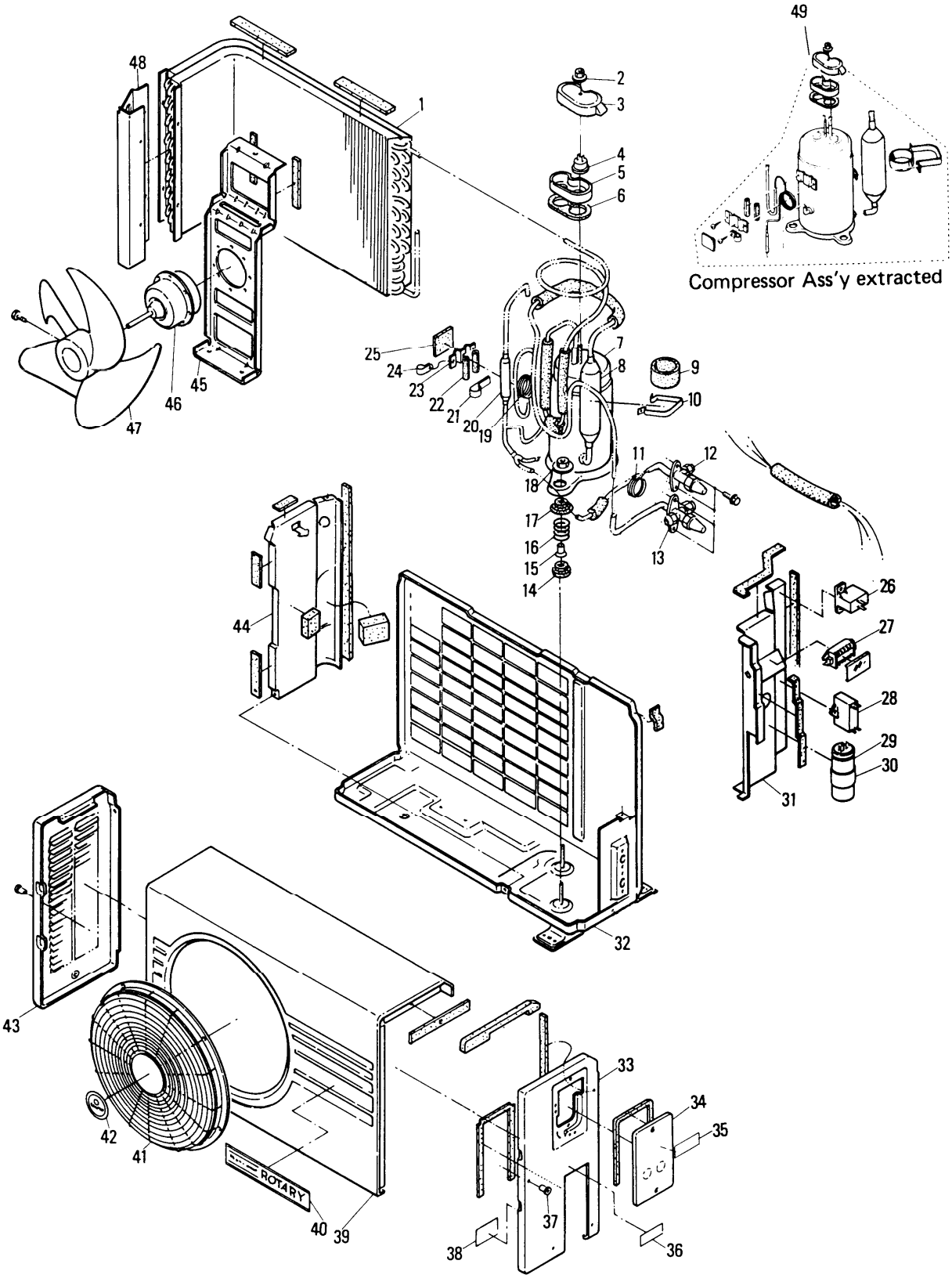
Key No.	Part No.	Description	Q'ty
1	852-2-2324-145H2	Mounting Plate Ass'y, Evaporator	1
2	852-2-2230-11501	Rear Panel	1
3	852-2-2231-123H8	Frame Ass'y	1
4	852-2-1119-11711	Cover Plate	1
5	852-2-2511-13810	Cushion Rubber	2
6	851-0-5290-501M1	Fan Motor Ass'y	1
7	852-2-2520-160H2	Mounting Plate Ass'y, Fan Motor	1
8	852-2-2520-16111	Mounting Plate, Fan	1
9	852-0-2509-11701	Cross Fan Ass'y	1
10	852-2-2515-13111	Cover, Fan	1
11	852-2-2511-13610	Cushion Rubber	1
12	852-0-2510-11900	Bearing Housing Ass'y	1
13	852-2-2351-14301	Cover, Evaporator	1
14	852-2-2309-33701	Mounting Plate, Evaporator	1
15	852-0-4101-44700	Evaporator Ass'y	1
16	852-0-2303-166H7	Drain Pan Ass'y	1
17	852-2-2309-32701	Mounting Plate, Evaporator	1
18	852-0-1303-12100	Drain Hose Ass'y	1
19	859-472-60	Controller POW-12KU	1
20	852-2-5310-16701	Mounting Plate, Electrical Component Box	1
21	852-0-5301-27601	Electrical Component Box Ass'y	1
22	851-0-5290-501P1	Transformer Ass'y ATR-J121UI	1
23	4-2239-51163	Fixed Capacitor	1
24	852-2-5315-22601	Cover Plate	1
25	852-2-5315-22701	Cover Plate	1
26	4-2329-56245	Relay VF24HU	1
27	852-2-5315-22501	Cover Plate	1
28	851-6-4729-14600	Label	1
29	4-2379-56159	Terminal Base	1
30	852-2-5305-14101	Cover Plate	1
31	859-601-41	Indicator Lamp IND-12KU	1
32	852-2-1506-12601	Knob	1
33	852-2-5309-14800	Cover Plate	1
34	852-2-5328-10810	Cover	1
35	852-2-1513-40311	Ornamental Plate	1
36	852-2-1516-15001	Ornamental Plate	1
37	852-2-1513-42001	Ornamental Plate	1
38	852-2-1122-14301	Stopper	1
39	852-0-1111-13101	Guard Ass'y	1
40	852-2-1504-17901	Badge	1
41	851-2-5250-61901	Wiring Diagram	1
42	852-2-1501-181N1	Grille Ass'y (includes Key No.38, 39,40,41,43,51,52)	1
43	852-2-1335-31100	Name Plate	1
44	852-2-1514-23611	Mounting, Blade	2
45	852-2-1519-17611	Blade	14
46	852-2-1406-27200	Insulation, Flap	1
47	852-2-1516-14511	Flap	1
48	852-2-1514-23211	Mounting	1
49	852-2-1406-27300	Insulation, Flap	1
50	852-6-4159-51800	Note	1
51	852-2-1516-145H9	Flap Ass'y	1
52	852-0-2307-14611	Air Filter Ass'y	2
53	859-213-97	Remote Control Switch Ass'y	1
54	851-2-5378-00101	Mounting Plate	1
■	852-6-4119-41900	Operation Manual	1

NOTE: Metal and plastic parts will be supplied basically with necessary heat insulating pads or packing.

6

SAP91KC

SAP91C
OUTDOOR UNIT



SAP91KC

SAP91C
OUTDOOR UNIT

ATTENTION !

To ensure correct parts supply, please let us know followings, when you make service parts order:
1. Part No. 2. Description 3. Q'ty 4. Volts - Hz - Ph 5. PRODUCT MODEL NO.

Key No.	Part No.	Description	Q'ty	
1	852-0-4102-27900	Condenser Ass'y	1	
2	801-2-8305-10100	Nut 5mm	1	
3	801-2-6195-10300	Cap Terminal Cover	1	
4	4-2329-69043	Relay MRA98675	1	
5	801-2-6194-10700	Cover Terminal	1	
6	801-2-5303-12100	Gasket Terminal	1	
7	806-717-42	Compressor C-R70H2V	1	
8	852-0-4511-14800	Accumulator Ass'y	1	
9	852-2-2353-38310	Packing, Accumulator	1	
10	852-2-2356-14601	Band Mounting, Accumulator	1	
11	852-2-4219-44800	Capillary Tube	1	
12	852-0-4501-24600	Valve Ass'y 1/4"	1	
13	852-0-4501-24500	Valve Ass'y 1/8"	1	
14	851-2-2390-13700	Cushion Rubber	1	
14	851-2-2390-13100	Cushion Rubber	2	
15	851-2-1314-17301	Stopper	3	
16	851-2-2330-13001	Spring	3	
17	851-2-2390-13600	Cushion Rubber	3	
18	851-0-2395-10501	Nut Special Ass'y	3	
19	852-0-4202-55600	Capillary Tube Ass'y	1	
20	852-0-4505-14310	Dehydrater Ass'y	1	
21	851-2-5354-00300	Clamper	1	
22	852-2-2353-19500	Packing	2	
23	852-2-2309-34101	Mounting Plate, Capillary Tube	1	
24	3-9030-00506	Clamper	1	
25	852-2-2353-19810	Packing	1	
26	4-2049-60042	Thermistor	1	
27	4-2379-56161	Therminal Base	1	
28	4-2239-51170	Fixed Capacitor, 220VAC 6MFD	1	
29	4-2239-56318	Fixed Capacitor, 350VAC 30MFD	1	
30	852-2-5301-21201	Clip, Capacitor	1	
31	852-0-5301-277H1	Electrical Component Box Ass'y	1	
32	852-0-2202-235H1	Bottom Plate Ass'y	1	
33	852-2-1114-202H1	Side Panel Ass'y, Right	1	
34	852-2-5315-224H1	Cover Plate Ass'y	1	
35	851-6-4729-14600	Label	1	
36	852-2-1335-30200	Name Plate	1	
37	852-2-2326-14302	Spacer	2	
38	851-2-5250-62001	Wiring Diagram	1	
39	852-2-1112-150D1	Cabinet Ass'y	1	
40	852-2-1316-19301	Mark	1	
41	852-0-1111-13001	Guard Ass'y	1	
42	852-2-1316-19901	Mark	1	
43	852-0-1104-14912	Side Panel Ass'y, Left	1	
44	852-2-2202-173H4	Partition Plate Ass'y	1	
45	852-2-2354-140H1	Mounting Plate Ass'y, Fan Motor	1	
46	851-0-5290-502M1	Fan Motor Ass'y	1	
47	852-0-2502-12611	Propeller Fan Ass'y	1	
48	852-2-2351-14101	Cover, Condenser	1	
49	852-0-4516-13600	Compressor Ass'y	1	
■	3-9502-02210	Refrigerant R-22	1110gr.	* This amount of refrigerant includes 40 g (=0.088 lbs.) necessary for quick purge.
■	3-9504-10310	Compressor Oil	500cc.	

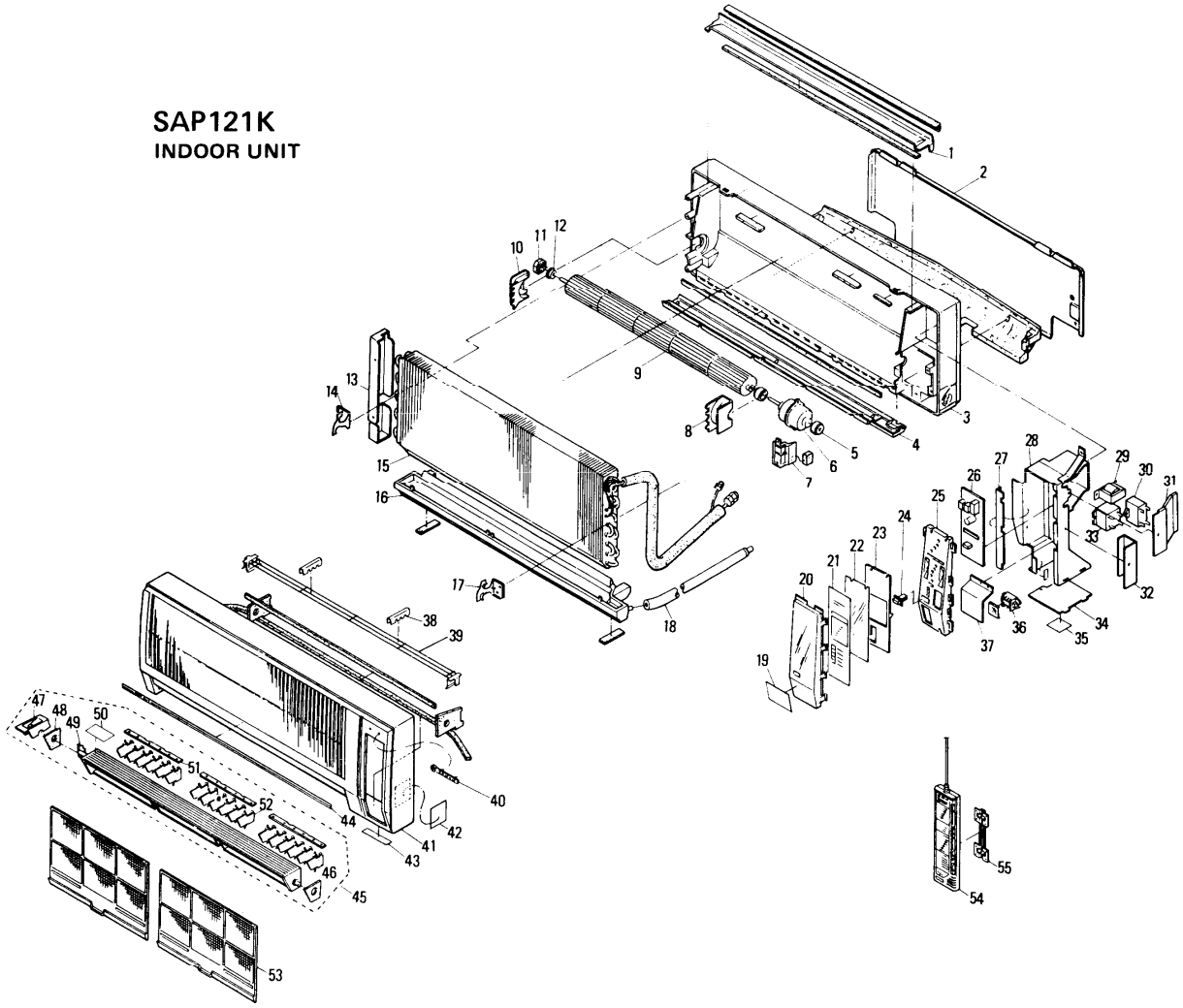
NOTE: Metal and plastic parts will be supplied basically with necessary heat insulating pads or packing.

6

PARTS LIST (SAP121KC)

MODEL NO.	PRODUCT CODE NO.
SAP121K	85264149
SAP121C	85274087

SAP121K
INDOOR UNIT



■ **Accessories Supplied with Unit for Installation**

Parts	Figure	Q'ty	Code
Anchor		10	852-2-1311-11600
Cover		1	852-2-2369-15200
Cover		1	859-2-1124-10302
Tapping Screw, Truss	4x16mm	6	3-9219-41601
Tapping Screw, Flat	3x10mm	2	3-9222-31001
Full Scale Installation Diagram		1	852-6-4139-55700

Parts	Figure	Q'ty	Code
Insul, Nipple		1	852-2-2414-12400
Cord Clip		2	851-2-5354-00101
Mounting Bracket		1	851-2-5378-00101
Tapping Screw, Pan	4x16mm	2	3-9221-41601
Drain Hose		1	852-2-4204-10901

WM-11610

ATTENTION !

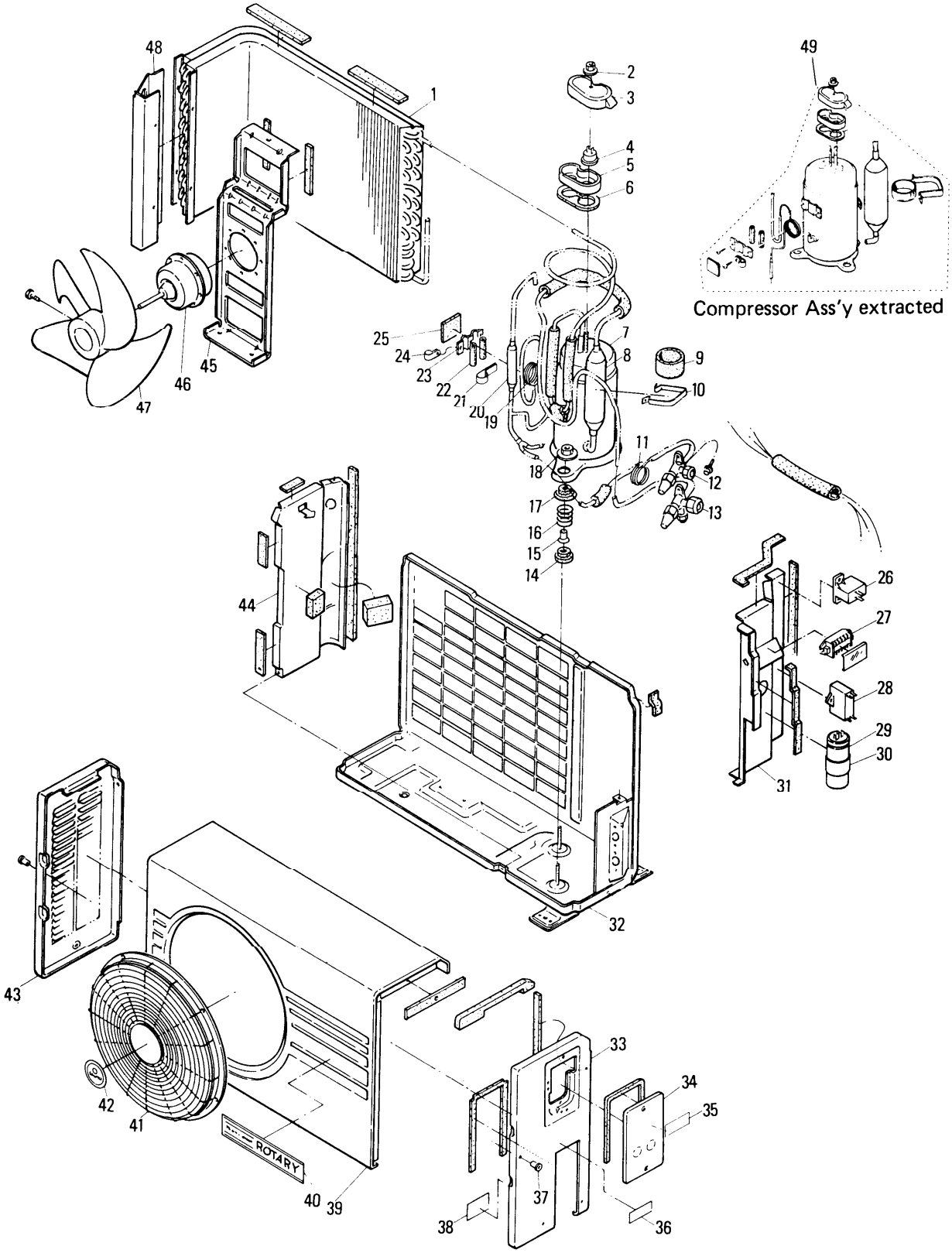
To ensure correct parts supply, please let us know followings, when you make service parts order:
1. Part No. 2. Description 3. Q'ty 4. Volts - Hz - Ph 5. PRODUCT MODEL NO.

Key No.	Part No.	Description	Q'ty
1	852-2-2324-149H2	Mounting Plate Ass'y, Evaporator	1
2	852-2-2230-11801	Rear Panel	1
3	852-2-2231-134H3	Frame Ass'y	1
4	852-2-1119-11911	Cover Plate	1
5	852-2-2511-13810	Cushion Rubber	2
6	851-0-5290-501M2	Fan Motor Ass'y FV4T-11F1PE	1
7	852-2-2520-160H2	Mounting Plate Ass'y, Fan Motor	1
8	852-2-2520-16111	Mounting Plate, Fan Motor	1
9	852-0-2509-12811	Cross Fan Ass'y	1
10	852-2-2515-13111	Cover, Cross Fan	1
11	852-2-2511-13610	Cushion Rubber	1
12	852-0-2510-11900	Bearing Housing Ass'y	1
13	852-2-2324-14901	Cover, Evaporator	1
14	852-2-2309-33701	Mounting Plate	1
15	852-0-4101-45200	Evaporator Ass'y	1
16	852-0-2303-167H0	Drain Pan Ass'y	1
17	852-2-2309-32701	Mounting Plate	1
18	852-0-1303-12100	Drain Hose Ass'y	1
19	852-2-1513-36913	Ornamental Plate	1
20	852-2-1516-15001	Ornamental Plate	1
21	852-2-1513-40311	Ornamental Plate	1
22	852-2-5328-10810	Cover	1
23	852-2-5309-14800	Cover Plate	1
24	852-2-1506-12601	Knob	1
25	859-601-41	Indicator Lamp IND-12KU	1
26	859-472-60	Controller POW-12KU	1
27	852-2-5310-16701	Mounting Plate, Electrical Component Box	1
28	852-0-5301-27601	Electrical Component Box Ass'y	1
29	851-0-5290-501P1	Transformer Ass'y ATR-J121UI	1
30	4-2239-51164	Fixed Capacitor	1
31	852-2-5315-22601	Cover Plate	1
32	852-2-5315-22701	Cover Plate	1
33	4-2329-56245	Relay VF24HU	1
34	852-2-5315-22501	Cover Plate	1
35	851-6-4729-14600	Note	1
36	4-2379-56159	Terminal Base	1
37	852-2-5305-14101	Cover Plate	1
38	852-2-1122-14301	Stopper	2
39	852-0-1111-13201	Guard Ass'y	1
40	852-2-1504-17901	Badge	1
41	852-2-1501-183H5	Grille Ass'y (includes Key No.38, 39,40,42,43,44,45,53)	1
42	851-2-5250-61900	Wiring Diagram	1
43	852-2-1335-31300	Name Plate	1
44	852-2-1513-42001	Ornamental Plate	1
45	852-2-1516-153H4	Flap Ass'y (includes Key No.45,46, 47,48,49,50,51)	1
46	852-2-1406-27200	Insulation, Flap	1
47	852-2-1514-23211	Mounting, Flap	1
48	852-2-1406-27300	Insulation, Flap	1
49	852-2-1516-15311	Flap	1
50	852-6-4159-51200	Note	1
51	852-2-1514-23811	Mounting	3
52	852-2-1519-17611	Blade	18
53	852-0-2307-14811	Air Filter Ass'y	1
54	859-213-97	Remote Control Switch Ass'y RCS-12KU	1
55	851-2-5378-00101	Mounting Plate	1
■	852-6-4119-41900	Operation Manual	1

NOTE: Metal and plastic parts will be supplied basically with necessary heat insulating pads or packing.

SAP121KC

SAP121C
OUTDOOR UNIT



SAP121KC

SAP121C
OUTDOOR UNIT

ATTENTION !

To ensure correct parts supply, please let us know followings, when you make service parts order:
1. Part No. 2. Description 3. Q'ty 4. Volts - Hz - Ph 5. PRODUCT MODEL NO.

Key No.	Part No.	Description	Q'ty	
1	852-0-4102-27800	Condenser Ass'y	1	
2	801-2-8305-10100	Nut 5mm	1	
3	801-2-6195-10300	Cap Terminal Cover	1	
4	4-2329-69092	Relay MRA98693	1	
5	801-2-6194-10700	Cover Terminal	1	
6	801-2-5303-12100	Gasket Terminal	1	
7	806-910-42	Compressor C-R90H2S	1	
8	852-0-4511-14500	Accumulator Ass'y	1	
9	852-2-2353-38310	Packing, Accumulator	1	
10	852-2-2356-14601	Band Mounting, Accumulator	1	
11	852-2-4219-49900	Capillary Tube	1	
12	852-0-4522-10100	Valve Ass'y 1/2"	1	
13	852-0-4515-10600	Valve Ass'y 1/4"	1	
14	851-2-2390-13700	Cushion Rubber	1	
14	851-2-2390-13100	Cushion Rubber	2	
15	851-2-1314-17301	Stopper	3	
16	851-2-2330-13001	Spring	3	
17	851-2-2390-13600	Cushion Rubber	3	
18	851-0-2395-10501	Nut Special Ass'y	3	
19	852-0-4202-44100	Capillary Tube Ass'y	1	
20	852-0-4505-14310	Dehydrater Ass'y	1	
21	851-2-5354-00300	Clamper	1	
22	852-2-2353-19500	Packing	2	
23	852-2-2309-34101	Mounting Plate, Capillary Tube	1	
24	3-9030-00506	Clamper	1	
25	852-2-2353-19810	Packing	1	
26	4-2049-60042	Thermistor	1	
27	4-2379-56161	Therminal Base	1	
28	4-2239-51171	Fixed Capacitor, 220VAC 8MFD	1	
29	4-2239-56319	Fixed Capacitor, 350VAC 35MFD	1	
30	852-2-5301-21201	Clip, Capacitor	1	
31	852-0-5301-277H1	Electrical Component Box Ass'y	1	
32	852-0-2202-226H1	Bottom Plate Ass'y	1	
33	852-2-1114-202H1	Side Panel Ass'y, Right	1	
34	852-2-5315-224H1	Cover Plate Ass'y	1	
35	851-6-4729-14600	Label	1	
36	852-2-1335-30300	Name Plate	1	
37	852-2-2326-14302	Spacer	2	
38	851-2-5250-62000	Wiring Diagram	1	
39	852-2-1112-150D1	Cabinet Ass'y	1	
40	852-2-1316-19301	Mark	1	
41	852-0-1111-13001	Guard Ass'y	1	
42	852-2-1316-19901	Mark	1	
43	852-0-1104-14912	Side Panel Ass'y, Left	1	
44	852-2-2202-173H4	Partition Plate Ass'y	1	
45	852-2-2354-140H1	Mounting Plate Ass'y, Fan Motor	1	
46	851-0-5290-502M2	Fan Motor Ass'y	1	
47	852-0-2502-12611	Propeller Fan Ass'y	1	
48	852-2-2351-14101	Cover, Condenser	1	
49	852-0-4516-13100	Compressor Ass'y	1	
■	3-9502-02210	Refrigerant R-22 1180gr.		* This amount of refrigerant includes 40 g (= 0.088 lbs.) necessary for quick purge.
■	3-9504-10510	Compressor Oil 650cc.		

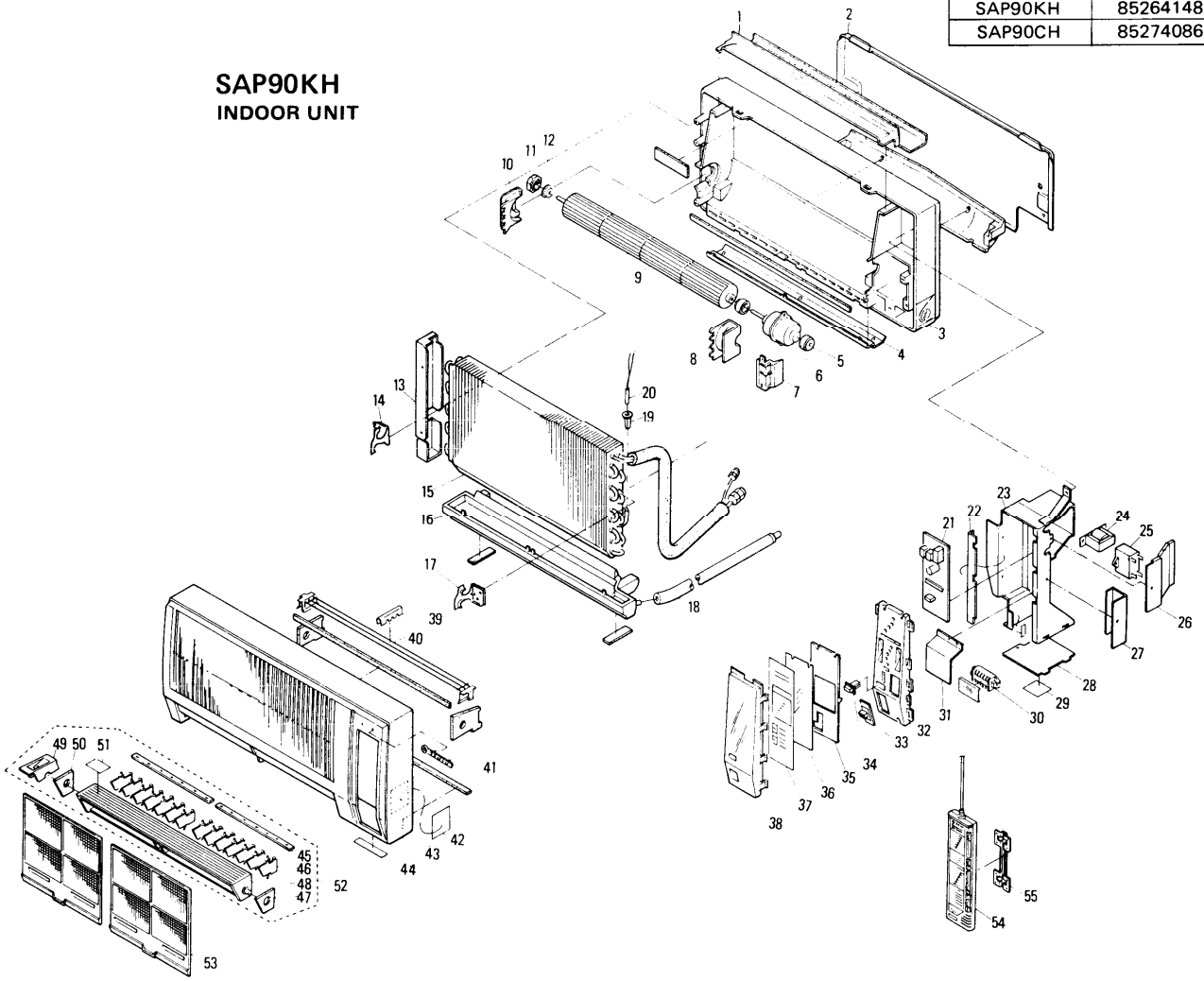
NOTE: Metal and plastic parts will be supplied basically with necessary heat insulating pads or packing.

6

PARTS LIST (SAP90KCH)

MODEL NO.	PRODUCT CODE NO.
SAP90KH	85264148
SAP90CH	85274086

SAP90KH
INDOOR UNIT



■ **Accessories Supplied with Unit for Installation**

Parts	Figure	Q'ty	Code
Anchor		10	852-2-1311-11600
Cover		1	852-2-2369-15200
Cover		1	859-2-1124-10302
Tapping Screw, Truss	(5/8") 4x16mm	6	3-9219-41601
Tapping Screw, Flat	(3/8") 3x10mm	2	3-9222-31001
Full Scale Installation Diagram		1	852-6-4139-60000

Parts	Figure	Q'ty	Code
Insul, Nipple		1	852-2-2414-12400
Cord Clip		2	851 2 5354 00101
Mounting Bracket		1	851-2-5378-00101
Tapping Screw, Pan	(5/8") 4x16mm	2	3-9221-41601
Drain Hose		1	852-2-4204-10901

WM-11608

11. APPENDIX

11.1. Conversion Tables

Centigrade ⟷ Fahrenheit

Numbers in the center column (between those marked C and F) refer to temperature, Centigrade or Fahrenheit, which it is desired to convert into the other scale. To convert from Fahrenheit to Centigrade find equivalent temperature in left hand column

°C.		°F.	°C.		°F.	°C.		°F.	°C		°F	°C		°F	°C		°F
−40.0	−40	−40.0	− 6.7	20	68.0	15.6	60	140.0	37.8	100	212.0	82.2	180	356.0	137.8	280	536.0
−38.9	−38	−36.4	− 6.1	21	69.8	16.1	61	141.8	38.9	102	215.6	83.3	182	359.6	140.6	285	545.0
−37.8	−36	−32.8	− 5.6	22	71.6	16.7	62	143.6	40.0	104	219.2	84.4	184	363.2	143.3	290	554.0
−36.7	−34	−29.2	− 5.0	23	73.4	17.2	63	145.4	41.1	106	222.8	85.6	186	366.8	146.1	295	563.0
−35.6	−32	−25.6	− 4.4	24	75.2	17.8	64	147.2	42.2	108	226.4	86.7	188	370.4	148.9	300	572.0
−34.4	−30	−22.0	− 3.9	25	77.0	18.3	65	149.0	43.3	110	230.0	87.8	190	374.0	151.7	305	581.0
−33.3	−28	−18.4	− 3.3	26	78.8	18.9	66	150.8	44.4	112	233.6	88.9	192	377.6	154.4	310	590.0
−32.2	−26	−14.8	− 2.8	27	80.6	19.4	67	152.6	45.6	114	237.2	90.0	194	381.2	157.2	315	599.0
−31.1	−24	−11.2	− 2.2	28	82.4	20.0	68	154.4	46.7	116	240.8	91.1	196	384.8	160.0	320	608.0
−30.0	−22	− 7.6	− 1.7	29	84.2	20.6	69	156.2	47.8	118	244.4	92.2	198	388.4	162.8	325	617.0
−28.9	−20	− 4.0	− 1.1	30	86.0	21.1	70	158.0	48.9	120	248.0	93.3	200	392.0	165.6	330	626.0
−27.8	−18	− 0.4	− 0.6	31	87.8	21.7	71	159.8	50.0	122	251.6	94.4	202	395.6	168.3	335	635.0
−26.7	−16	3.2	0.0	32	89.6	22.2	72	161.6	51.1	124	255.2	95.6	204	399.2	171.1	340	644.0
−25.6	−14	6.8	+ 0.6	33	91.4	22.8	73	163.4	52.2	126	258.8	96.7	206	402.8	173.9	345	653.0
−24.4	−12	10.4	1.1	34	93.2	23.3	74	165.2	53.3	128	262.4	97.8	208	406.4	176.7	350	662.0
−23.3	−10	14.0	1.7	35	95.0	23.9	75	167.0	54.4	130	266.0	98.9	210	410.0	179.4	355	671.0
−22.2	− 8	17.6	2.2	36	96.8	24.4	76	168.8	55.6	132	269.6	100.0	212	413.6	182.2	360	680.0
−21.1	− 6	21.2	2.8	37	98.6	25.0	77	170.6	56.7	134	273.2	101.1	214	417.2	185.0	365	689.9
−20.0	− 4	24.8	3.3	38	100.4	25.6	78	172.4	57.8	136	276.8	102.2	216	420.8	188.2	370	698.0
−18.9	− 2	28.4	3.9	39	102.2	26.1	79	174.2	58.9	138	280.4	103.3	218	424.4	190.6	375	707.0
−17.8	0	32.0	4.4	40	104.0	26.7	80	176.0	60.0	140	284.0	104.4	220	428.0	193.3	380	716.0
−17.2	1	33.8	5.0	41	105.8	27.2	81	177.8	61.1	142	287.6	105.6	222	431.6	196.1	385	725.0
−16.7	2	35.6	5.6	42	107.6	27.8	82	179.6	62.2	144	291.2	106.7	224	435.2	198.9	390	734.0
−16.1	3	37.4	6.1	43	109.4	28.3	83	181.4	63.3	146	294.8	107.8	226	438.8	201.7	395	743.0
−15.6	4	39.2	6.7	44	111.2	28.9	84	183.2	64.4	148	298.4	108.9	228	442.4	204.4	400	752.0
−15.0	5	41.0	7.2	45	113.0	29.4	85	185.0	65.6	150	302.0	110.0	230	446.0	210.0	410	770.0
−14.4	6	42.8	7.8	46	114.8	30.0	86	186.8	66.7	152	305.6	111.1	232	449.6	215.6	420	788.0
−13.9	7	44.6	8.3	47	116.6	30.6	87	188.6	67.8	154	309.2	112.2	234	453.2	221.1	430	806.0
−13.3	8	46.4	8.9	48	118.4	31.1	88	190.4	68.9	156	312.8	113.3	236	456.8	226.7	440	824.0
−12.8	9	48.2	9.4	49	120.2	31.7	89	192.2	70.0	158	316.4	114.4	238	460.4	232.2	450	842.0
−12.2	10	50.0	10.0	50	122.0	32.2	90	194.0	71.1	160	320.0	115.6	240	464.0	237.8	460	860.0
−11.7	11	51.8	10.6	51	123.8	32.8	91	195.8	72.2	162	323.6	116.7	242	467.6	243.3	470	878.8
−11.1	12	53.6	11.1	52	125.6	33.3	92	197.6	73.3	164	327.2	117.8	244	471.2	248.9	480	896.0
−10.6	13	55.4	11.7	53	127.4	33.9	93	199.4	74.4	166	330.8	118.3	245	473.0	254.4	490	914.0
−10.0	14	57.2	12.2	54	129.2	34.4	94	201.2	75.6	168	334.4	121.1	250	482.0	260.0	500	932.0
− 9.4	15	59.0	12.8	55	131.0	35.0	95	203.0	76.7	170	338.0	123.9	255	491.0	265.6	510	950.0
− 8.9	16	60.8	13.3	56	132.8	35.6	96	204.8	77.8	172	341.6	126.7	260	500.0	271.1	520	968.0
− 8.3	17	62.6	13.9	57	134.6	36.1	97	206.6	78.9	174	345.2	129.4	265	509.0	276.7	530	986.0
− 7.8	18	64.4	14.4	58	136.4	36.7	98	208.4	80.0	176	348.8	132.2	270	518.0	282.3	540	1004.0
− 7.2	19	66.2	15.0	59	138.2	37.2	99	210.2	81.1	178	352.4	135.0	275	527.0	287.8	550	1022.0

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Kilocalorie ➡ British Thermal Units (1kcal = 3.9683 B. T. U.)

Kilocalories	0	1	2	3	4	5	6	7	8	9
	B.T.U.	B.T.U.	B.T.U.	B.T.U.	B.T.U.	B.T.U.	B.T.U.	B.T.U.	B.T.U.	B.T.U.
0	.....	3.968	7.937	11.905	15.873	19.841	23.810	27.778	31.746	35.714
10	39.683	43.651	47.619	51.587	55.556	59.524	63.497	67.460	71.429	75.391
20	79.365	83.333	87.302	91.270	95.238	99.206	103.175	107.143	111.111	115.079
30	119.048	123.016	126.984	130.952	134.921	138.889	142.857	146.825	150.794	154.762
40	158.730	162.698	166.667	170.635	174.603	178.571	182.540	186.508	190.476	194.444
50	198.413	202.381	206.349	210.317	214.286	218.254	222.222	226.190	230.159	234.127
60	238.095	242.063	246.032	250.000	253.968	257.936	261.905	265.873	269.841	273.809
70	277.778	281.746	285.741	289.682	293.651	297.619	301.587	305.555	309.524	313.492
80	317.460	321.428	325.397	329.365	333.333	337.301	341.270	345.238	349.206	353.174
90	357.143	361.111	365.079	369.047	373.016	376.984	380.952	384.920	388.889	392.857
100	386.250	400.793	404.762	408.730	412.698	416.666	420.635	424.603	428.571	432.539

Kilograms ➡ Pounds (1kg = 2.205 lbs.)

Kilograms	0	1	2	3	4	5	6	7	8	9
	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.
0	.....	2.205	4.409	6.614	8.818	11.023	13.228	15.432	17.637	19.842
10	22.046	24.251	26.455	28.660	30.865	33.069	35.274	37.479	39.683	41.888
20	44.092	46.297	48.502	50.706	52.911	55.116	57.320	59.535	61.729	63.934
30	66.139	68.343	70.548	72.752	74.957	77.162	79.366	81.571	83.766	85.980
40	88.185	90.390	92.594	94.799	97.003	99.208	101.41	103.62	105.82	108.03
50	110.23	112.44	114.64	116.84	119.05	121.25	123.46	125.66	127.87	130.07
60	132.28	134.48	136.69	138.89	141.10	143.30	145.51	147.71	149.91	152.12
70	154.32	156.53	158.73	160.94	163.14	165.35	167.55	169.76	171.96	174.17
80	176.37	178.57	180.78	182.98	185.19	187.39	189.60	191.80	194.01	196.21
90	198.42	200.62	202.83	205.03	207.23	209.44	211.64	213.85	216.05	218.26
100	220.46	222.67	224.87	227.08	229.28	231.49	233.69	235.89	238.10	240.30

Liters ➡ U. S. Gallons (1Lit. = 0.264Gallons)

Liters	0	1	2	3	4	5	6	7	8	9
	Gallons	Gallons	Gallons	Gallons	Gallons	Gallons	Gallons	Gallons	Gallons	Gallons
0	.....	0.264	0.528	0.739	1.057	1.321	1.585	1.849	2.113	2.378
10	2.642	2.906	3.170	3.434	3.698	3.963	4.277	4.491	4.755	5.019
20	5.283	5.548	5.812	6.076	6.340	6.604	6.868	7.133	7.397	7.611
30	7.925	8.189	8.453	8.718	8.982	9.246	9.510	9.774	10.038	10.303
40	10.567	10.831	11.095	11.359	11.623	11.888	12.152	12.416	12.680	12.944
50	13.209	13.473	13.737	14.001	14.265	14.529	14.794	15.058	15.322	15.586
60	15.850	16.114	16.379	16.643	16.907	17.171	17.435	17.699	17.964	18.288
70	18.492	18.756	19.020	19.284	19.549	19.813	20.077	20.341	20.605	20.869
80	21.134	21.398	21.662	21.926	22.190	22.454	22.719	22.983	23.247	23.511
90	23.775	24.040	24.304	24.568	24.832	25.096	25.360	25.625	25.889	26.153
100	26.417	26.681	26.945	27.210	27.474	27.738	28.002	28.266	28.530	28.795

Kilograms per Square Centimeter ➡ Pounds per Square Inch (1kg/cm² = 14.22 lbs/In.²)

Kilograms per Sq. Cm.	0	1	2	3	4	5	6	7	8	9
	Lbs. Per Sq. In.	Lbs. Per Sq. In.	Lbs. Per Sq. In.	Lbs. Per Sq. In.	Lbs. Per Sq. In.	Lbs. Per Sq. In.	Lbs. Per Sq. In.	Lbs. Per Sq. In.	Lbs. Per Sq. In.	Lbs. Per Sq. In.
0	.....	14.22	28.45	42.67	56.89	71.12	85.34	99.56	113.78	128.01
10	142.23	156.45	170.68	184.90	199.12	213.35	227.57	241.79	256.02	270.24
20	284.46	298.69	312.91	327.13	341.36	355.58	369.80	384.03	398.25	412.47
30	426.70	440.92	455.14	469.36	483.59	497.81	512.03	526.26	540.48	554.70
40	568.93	583.15	597.37	611.60	625.82	640.04	654.27	668.49	682.71	696.94
50	711.16	725.38	739.61	753.83	768.05	782.28	796.50	810.72	824.94	839.17
60	853.39	867.61	881.84	896.06	910.28	924.51	938.73	952.95	967.18	981.40
70	995.62	1009.8	1024.1	1038.3	1052.5	1066.7	1081.0	1095.2	1109.4	1123.6
80	1137.8	1152.1	1166.3	1180.5	1194.7	1209.0	1223.2	1237.4	1251.6	1265.9
90	1280.1	1294.3	1308.5	1322.7	1337.0	1351.2	1365.4	1379.6	1393.9	1408.1
100	1422.3	1436.5	1450.8	1465.0	1479.2	1493.4	1507.7	1521.9	1536.1	1550.3

Square Centimeters ➡ Square Inches (1cm² 0.155 In.²)

Square Cm.	0 Sq. In.	1 Sq. In.	2 Sq. In.	3 Sq. In.	4 Sq. In.	5 Sq. In.	6 Sq. In.	7 Sq. In	8 Sq. In.	9 Sq. In.
0	.....	0.155	0.310	0.465	0.620	0.775	0.930	1.085	1.240	1.395
10	1.550	1.705	1.860	2.015	2.170	2.325	2.480	2.635	2.790	2.945
20	3.100	3.255	3.410	3.565	3.720	3.875	4.030	4.185	4.340	4.495
30	4.650	4.805	4.960	5.115	5.270	5.425	5.580	5.735	5.890	6.045
40	6.200	6.355	6.510	6.665	6.820	6.975	7.130	7.285	7.440	7.595
50	7.750	7.905	8.060	8.251	8.370	8.525	8.680	8.835	8.990	9.145
60	9.300	9.455	9.610	9.765	9.920	10.075	10.230	10.385	10.540	10.695
70	10.850	11.005	11.160	11.315	11.470	11.625	11.780	11.935	12.090	12.245
80	12.400	12.555	12.710	12.865	13.020	13.175	13.330	13.485	13.640	13.795
90	13.950	14.105	14.260	14.415	14.570	14.725	14.880	15.035	15.190	15.345
100	15.500	15.655	15.810	15.965	16.120	16.275	16.430	16.585	16.740	16.895

Square Meters ➡ Square Feet (1m² 10.76 Ft.²)

Square Meters	0 Sq. Ft.	1 Sq. Ft.	2 Sq. Ft.	3 Sq. Ft.	4 Sq. Ft.	5 Sq. Ft.	6 Sq. Ft.	7 Sq. Ft.	8 Sq. Ft.	9 Sq. Ft.
0	.....	10.76	21.53	32.29	43.06	53.82	64.58	75.35	86.11	96.88
10	107.64	118.40	129.17	139.93	150.69	161.46	172.22	182.99	193.75	204.51
20	215.28	226.04	236.81	247.57	258.33	269.10	279.86	290.62	301.39	312.15
30	322.92	333.68	344.44	355.21	365.97	376.74	387.50	398.26	409.03	419.79
40	430.55	441.32	452.08	462.85	473.61	484.37	495.14	505.90	516.67	527.43
50	538.19	548.96	559.72	570.48	581.25	592.01	602.78	613.54	624.30	635.07
60	645.83	656.60	667.36	678.12	688.89	699.65	710.42	721.18	731.94	742.71
70	753.47	764.23	775.00	785.76	796.53	807.29	818.05	828.82	839.58	850.35
80	861.11	871.87	882.64	893.40	904.16	914.93	925.69	936.46	947.22	957.98
90	968.75	979.51	990.28	1001.04	1011.80	1022.57	1033.33	1044.10	1054.86	1065.62
100	1076.39	1087.15	1097.92	1108.68	1119.44	1130.21	1140.97	1151.74	1162.50	1173.26

Cubic Centimeters ➡ Cubic Inches (1cm³ 0.061 In.³)

Cubic Cm.	0 Cubic Inches	1 Cubic Inches	2 Cubic Inches	3 Cubic Inches	4 Cubic Inches	5 Cubic Inches	6 Cubic Inches	7 Cubic Inches	8 Cubic Inches	9 Cubic Inches
0	.....	0.0610	0.1221	0.1831	0.2441	0.3051	0.3661	0.4272	0.4882	0.5492
10	0.6102	0.6712	0.7323	0.7933	0.8543	0.9153	0.9763	1.0374	1.0984	1.1594
20	1.2205	1.2815	1.3426	1.4063	1.4646	1.5256	1.5866	1.6477	1.7087	1.7697
30	1.8308	1.8918	1.9529	2.0139	2.0749	2.1359	2.1969	2.2580	2.3190	2.3800
40	2.4410	2.5020	2.5631	2.6241	2.6851	2.7461	2.8071	2.8682	2.9292	2.9902
50	3.0513	3.1123	3.1734	3.2344	3.2954	3.3564	3.4174	3.4785	3.5395	3.6005
60	3.6615	3 .7225	3.7836	3.8446	3.9056	3.9666	4.0276	4.0887	4.1497	4.2107
70	4.2718	4.3328	4.3939	4.4549	4.5159	4.5769	4.6379	4.6990	4.7600	4.8210
80	4.8820	4.9430	5.0041	5.0651	5.1261	5.1871	5.2481	5.3092	5.3702	5.4312
90	5.4923	5.5533	5.6144	5.6754	5.7364	5.7974	5.8584	5.9195	5.9805	6.0415
100	6.1025	6.1635	6.2246	6.2856	6.3466	6.4076	6.4686	6.5297	6.5907	6.6517

Cubic Metres ➡ Cubic Feet (1m³ 35.3 Ft.³)

Cubic Meters	0 Cubic Feet	1 Cubic Feet	2 Cubic Feet	3 Cubic Feet	4 Cubic Feet	5 Cubic Feet	6 Cubic Feet	7 Cubic Feet	8 Cubic Feet	9 Cubic Feet
0	.....	35.3	70.6	105.9	141.3	176.6	211.9	247.2	282.5	317.8
10	353.1	388.5	423.8	459.1	494.4	529.7	565.0	600.3	635.7	671.0
20	706.3	741.6	776.9	812.2	847.5	882.9	918.2	953.5	988.8	1024.1
30	1059.4	1094.7	1130.1	1165.4	1200.7	1236.0	1271.3	1306.6	1341.9	1377.3
40	1412.6	1447.9	1483.2	1518.5	1553.8	1589.2	1624.5	1659.8	1695.1	1730.4
50	1765.7	1801.0	1836.4	1871.7	1907.0	1942.3	1977.6	2012.9	2048.2	2083.6
60	2118.9	2154.2	2189.5	2224.8	2260.1	2295.4	2330.8	2366.1	2401.4	2436.7
70	2472.0	2507.3	2542.6	2578.0	2613.3	2648.6	2683.9	2719.2	2754.5	2789.8
80	2825.2	2860.5	2895.8	2931.1	2966.4	3001.7	3037.0	3072.4	3107.7	3143.0
90	3178.3	3213.6	3248.9	3284.2	3319.6	3354.9	3390.2	3425.5	3460.8	3496.1
100	3531.4	3566.7	3602.0	3637.3	3672.7	3708.0	3743.3	3778.6	3813.9	3849.2

Millimeters → Inches

Milli-meters	Inches	Milli-meters	Inches	Milli-meters	Inches
0.01	0.0004	0.35	0.0138	0.68	0.0268
0.02	0.0008	0.36	0.0142	0.69	0.0272
0.03	0.0012	0.37	0.0146	0.70	0.0276
0.04	0.0016	0.38	0.0150	0.71	0.0280
0.05	0.0020	0.39	0.0154	0.72	0.0283
0.06	0.0024	0.40	0.0157	0.73	0.0287
0.07	0.0028	0.41	0.0161	0.74	0.0291
0.08	0.0031	0.42	0.0165	0.75	0.0295
0.09	0.0035	0.43	0.0169	0.76	0.0299
0.10	0.0039	0.44	0.0173	0.77	0.0303
0.11	0.0043	0.45	0.0177	0.78	0.0307
0.12	0.0047	0.46	0.0181	0.79	0.0311
0.13	0.0051	0.47	0.0185	0.80	0.0315
0.14	0.0055	0.48	0.0189	0.81	0.0319
0.15	0.0059	0.49	0.0193	0.82	0.0323
0.16	0.0063	0.50	0.0197	0.83	0.0327
0.17	0.0067	0.51	0.0201	0.84	0.0331
0.18	0.0071	0.52	0.0205	0.85	0.0335
0.19	0.0075	0.53	0.0209	0.86	0.0339
0.20	0.0079	0.54	0.0213	0.87	0.0343
0.21	0.0083	0.55	0.0217	0.88	0.0346
0.22	0.0087	0.56	0.0220	0.89	0.0350
0.23	0.0091	0.57	0.0224	0.90	0.0354
0.24	0.0094	0.58	0.0228	0.91	0.0358
0.25	0.0098	0.59	0.0232	0.92	0.0362
0.26	0.0102	0.60	0.0236	0.93	0.0366
0.27	0.0106	0.61	0.0240	0.94	0.0370
0.28	0.0110	0.62	0.0244	0.95	0.0374
0.29	0.0114	0.63	0.0248	0.96	0.0378
0.30	0.0118	0.64	0.0252	0.97	0.0382
0.31	0.0122	0.65	0.0256	0.98	0.0386
0.32	0.0126	0.66	0.0260	0.99	0.0390
0.33	0.0130	0.67	0.0264	1.00	0.0394
0.34	0.0134	.....	.....	.....	.....

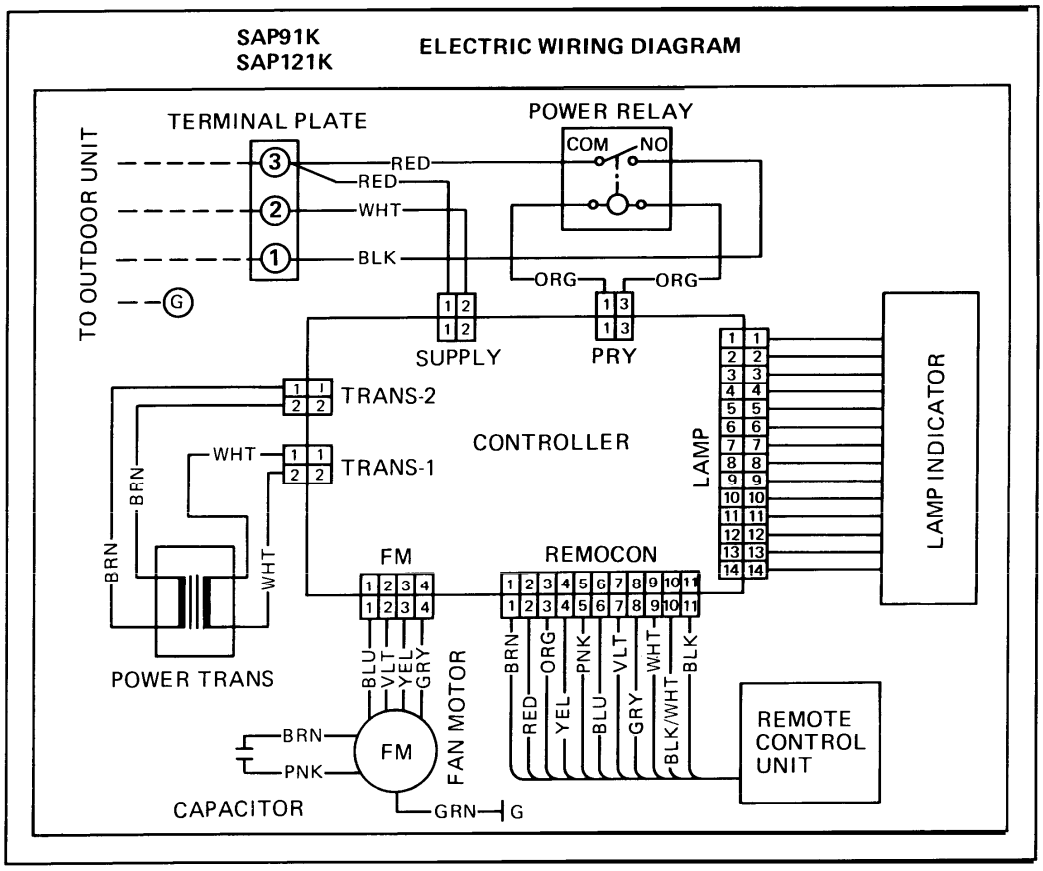
Inches → Millimeters

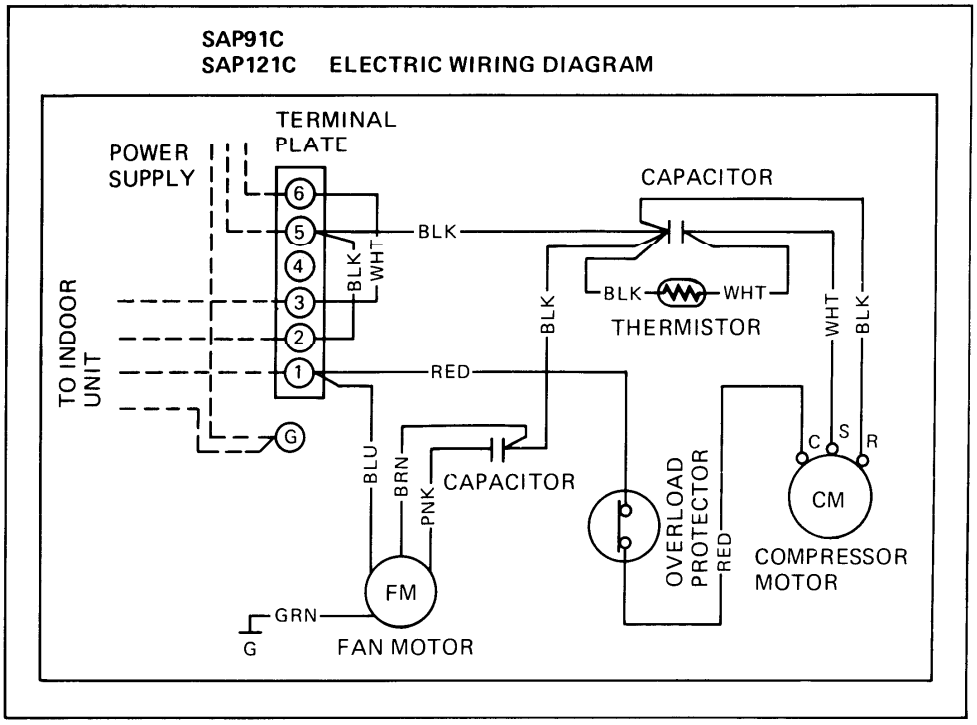
Inches	Milli-meters	Inches	Milli-meters	Inches	Milli-meters
0.001	0.025	0.290	7.37	0.660	16.76
0.002	0.051	0.300	7.62	0.670	17.02
0.003	0.076	0.310	7.87	0.680	17.27
0.004	0.102	0.320	8.13	0.690	17.53
0.005	0.127	0.330	8.38	0.700	17.78
0.006	0.152	0.340	8.64	0.710	18.03
0.007	0.178	0.350	8.89	0.720	18.29
0.008	0.203	0.360	9.14	0.730	18.54
0.009	0.229	0.370	9.40	0.740	18.80
0.010	0.254	0.380	9.65	0.750	19.05
0.020	0.508	0.390	9.91	0.760	19.30
0.030	0.762	0.400	10.16	0.770	19.56
0.040	1.016	0.410	10.41	0.780	19.81
0.050	1.270	0.420	10.67	0.790	20.07
0.060	1.524	0.430	10.92	0.800	20.32
0.070	1.778	0.440	11.18	0.810	20.57
0.080	2.032	0.450	11.43	0.820	20.83
0.090	2.286	0.460	11.68	0.830	21.08
0.100	2.540	0.470	11.94	0.840	21.34
0.110	2.794	0.480	12.19	0.850	21.59
0.120	3.048	0.490	12.45	0.860	21.84
0.130	3.302	0.500	12.70	0.870	22.10
0.140	3.56	0.510	12.95	0.880	22.35
0.150	3.81	0.520	13.21	0.890	22.61
0.160	4.06	0.530	13.46	0.900	22.86
0.170	4.32	0.540	13.72	0.910	23.11
0.180	4.57	0.550	13.97	0.920	23.37
0.190	4.83	0.560	14.22	0.930	23.62
0.200	5.08	0.570	14.48	0.940	23.88
0.210	5.33	0.580	14.73	0.950	24.13
0.220	5.59	0.590	14.99	0.960	24.38
0.230	5.84	0.600	15.24	0.970	24.64
0.240	6.10	0.610	15.49	0.980	24.89
0.250	6.35	0.620	15.75	0.990	25.15
0.260	6.60	0.630	16.00	1.000	25.40
0.270	6.86	0.640	16.26	.....	.....
0.280	7.11	0.650	16.51	.....	.....

Fractional Inches → Decimals and Millimeters

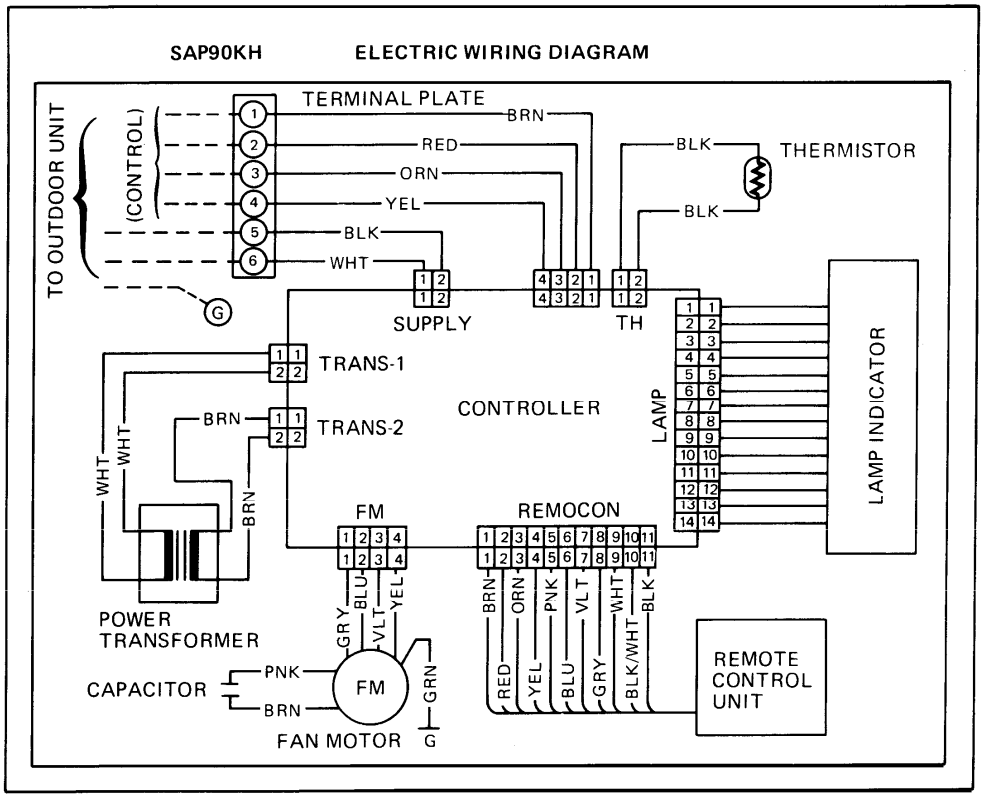
Inch	Decimal Inch	Millimeter	Inch	Decimal Inch	Millimeter	Inch	Decimal Inch	Millimeter	Inch	Decimal Inch	Millimeter
1/64	0.015625	0.396785	17/64	0.265623	6.746375	33/64	0.515625	13.096875	49/64	0.765625	19.446875
1/32	0.03125	0.79375	9/32	0.28125	7.14375	17/32	0.53125	13.49375	25/32	0.78125	19.84375
3/64	0.046875	1.190625	19/64	0.296875	7.540625	35/64	0.546875	13.890625	51/64	0.796875	20.240625
1/16	0.0625	1.5875	5/16	0.3125	7.9375	9/16	0.5625	14.2875	13/16	0.8125	20.6375
5/61	0.078125	1.984375	21/64	0.328125	8.334375	37/64	0.578125	14.684375	53/64	0.828125	21.034375
3/32	0.09375	2.38125	11/32	0.34375	8.73125	19/32	0.59375	15.08125	27/32	0.84375	21.43125
7/64	0.109375	2.778125	23/64	0.359375	9.128125	39/04	0.609375	15.478125	55/64	0.859375	21.828125
1/8	0.125	3.175	3/8	0.375	9.525	5/8	0.625	15.875	7/8	0.875	22.225
9/64	0.140625	3.571875	25/64	0.390625	9.921875	41/64	0.640625	16.271875	57/64	0.890625	22.621875
5/32	0.15625	3.96875	13/32	0.40625	10.31875	21/32	0.65625	16.66875	29/32	0.90625	23.01875
11/64	0.171875	4.365625	27/64	0.421875	10.715625	43/64	0.671875	17.065625	59/64	0.921875	23.415625
3/16	0.1875	4.7625	7/16	0.4375	11.1125	11/16	0.6875	17.4625	15/16	0.9375	23.8125
13/64	0.203125	5.159375	29/64	0.453125	11.509375	45/64	0.703125	17.859375	61/64	0.953125	24.209375
7/32	0.21875	5.55624	15/32	0.46875	11.90625	23/32	0.71875	18.25625	31/32	0.96875	24.60625
15/64	0.234375	5.953125	31/64	0.484375	12.303125	47/64	0.734375	18.653125	63/64	0.984375	25.003125
1/4	0.25	6.35001	1/2	0.50	12.7	3/4	0.75	19.05	1	1 00000	25.4

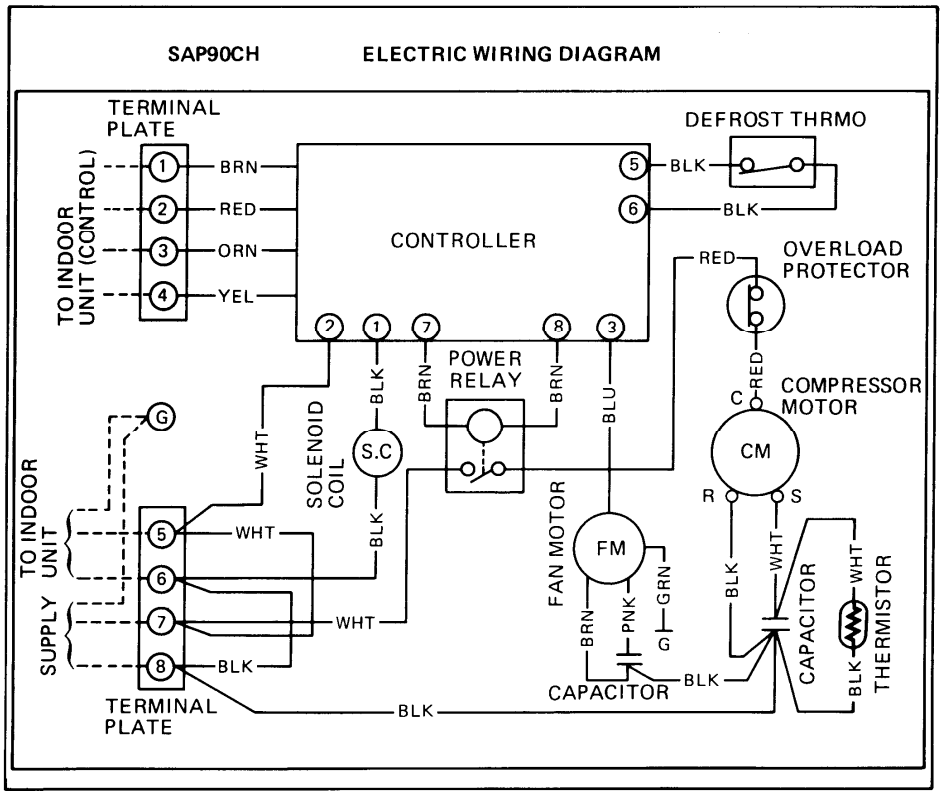
10. ELECTRIC WIRING DIAGRAM





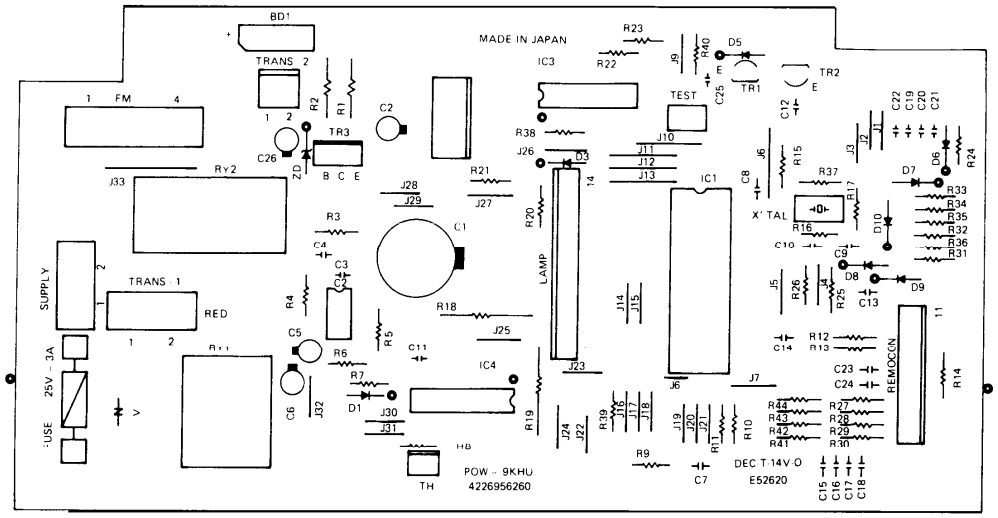
ELECTRIC WIRING DIAGRAM



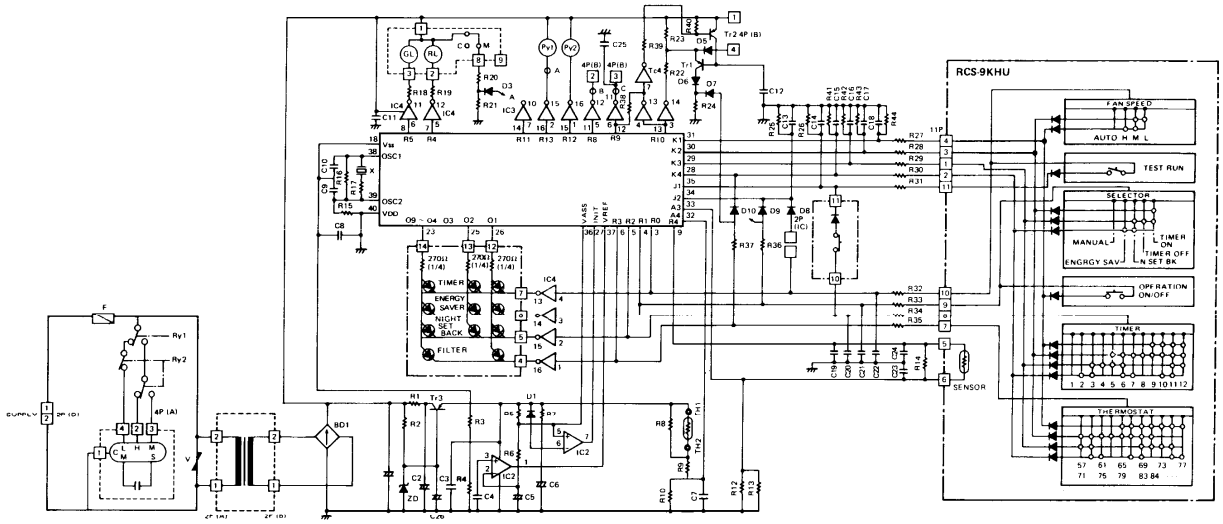


CONTROLLER P.C.B.(POW-9KHU) SAP90KCH

CONTROLLER PCB(PRINTED PATTERN)



ELECTRIC WIRING DIAGRAM(CONTROLLER PCB)



Key No.	Description			Key No.	Description			Key No.	Description			Key No.	Description			Key No.	Description
R1	Resistor	1W	100Ω	R21	Resistor	1/4W	1.6kΩ	R41	Resistor	1/4W	56kΩ	C16	Capacitor		0.0047μF	D9	Diode, DS442X
R2	Resistor	1W	1kΩ	R22	Resistor	1/4W	3.3kΩ	R42	Resistor	1/4W	56kΩ	C17	Capacitor		0.0047μF	D10	Diode, DS442X
R3	Resistor	1/4W	13kΩ	R23	Resistor	1/4W	2.2kΩ	R43	Resistor	1/4W	56kΩ	C18	Capacitor		0.0047μF		
R4	Resistor	1/4W	10kΩ	R24	Resistor	1/4W	3kΩ	R44	Resistor	1/4W	56kΩ	C19	Capacitor		0.0047μF	IC1	IC, TMS2600
R5	Resistor	1/4W	3.6kΩ	R25	Resistor	1/4W	10kΩ					C20	Capacitor		0.0047μF	IC2	IC, LA6548D ro 4558
R6	Resistor	1/4W	3.3kΩ	R26	Resistor	1/4W	22kΩ	C1	Capacitor	50V	470μF	C21	Capacitor		0.0047μF	IC3	IC, μPA2004C
R7	Resistor	1/4W	56kΩ	R27	Resistor	1/4W	470Ω	C2	Capacitor	50V	1μF	C22	Capacitor		0.0047μF	IC4	IC, μPA2004C
R8	Resistor	1/4W	68kΩ	R28	Resistor	1/4W	470Ω	C3	Capacitor		0.047μF	C23	Capacitor		0.01μF		
R9	Resistor	1/4W	5.6kΩ	R29	Resistor	1/4W	470Ω	C4	Capacitor		0.022μF	C24	Capacitor		0.022μF	X	Cristal, KBR400A
R10	Resistor	1/4W	36kΩ	R30	Resistor	1/4W	470Ω	C5	Capacitor	50V	1μF	C25	Capacitor		0.022μF	V	Varisstor, A275K
				R31	Resistor	1/4W	470Ω	C6	Capacitor	50V	0.47μF	C26	Capacitor	16V	10μF	F	Fuse, 125V 3A
R12	Resistor	1/4W	6.8kΩ	R32	Resistor	1/4W	100Ω	C7	Capacitor		0.047μF						
R13	Resistor	1/4W	39kΩ	R33	Resistor	1/4W	100Ω	C8	Capacitor		0.047μF	BD1	Bridge Diode, DBA10C			Tr1	Transistor, 2SA608EF
R14	Resistor	1/4W	18kΩ	R34	Resistor	1/4W	100Ω	C9	Capacitor		150pF	ZD	Zener Diode, GZA9.1Z			Tr2	Transistor, 2SA608EF
R15	Resistor	1/4W	5.6kΩ	R35	Resistor	1/4W	100Ω	C10	Capacitor		270pF	D1	Diode, DS442X			Tr3	Transistor, 2SD313EF
R16	Resistor	1/4W	56kΩ	R36	Resistor	1/4W	2kΩ	C11	Capacitor		0.047μF	D3	Diode, DS442X				
R17	Resistor	1/4W	100Ω	R37	Resistor	1/4W	4.3kΩ	C12	Capacitor		0.047μF	D5	Diode, DS442X			Ry1	Relay, LZG-24HE
R18	Resistor	2W	150Ω	R38	Resistor	1/4W	15kΩ	C13	Capacitor		0.022μF	D6	Diode, DS442X			Ry2	Relay, VB24TBU
R19	Resistor	2W	240Ω	R39	Resistor	1/4W	22kΩ	C14	Capacitor		0.01μF	D7	Diode, DS442X				
R20	Resistor	1/4W	1.6kΩ	R40	Resistor	1/4W	5.6kΩ	C15	Capacitor		0.0047μF	D8	Diode, DS442X				

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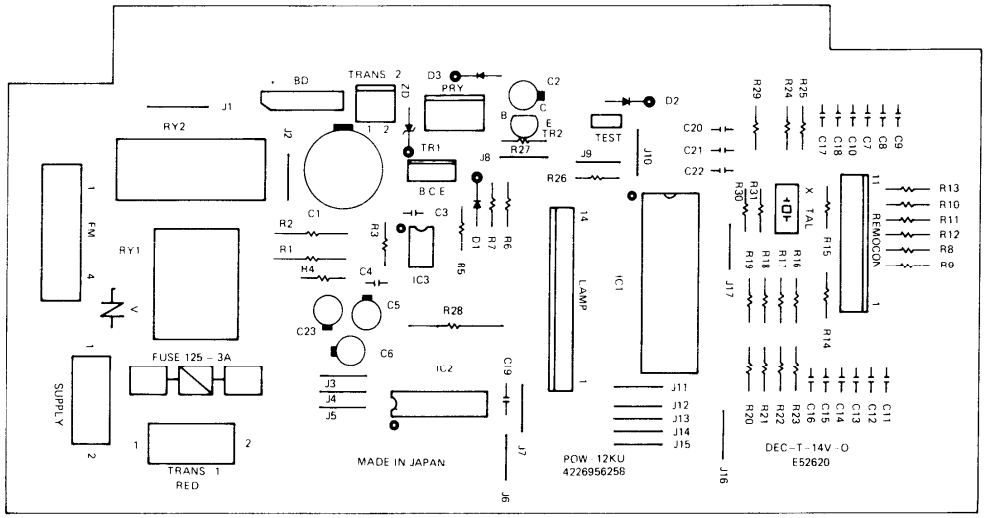
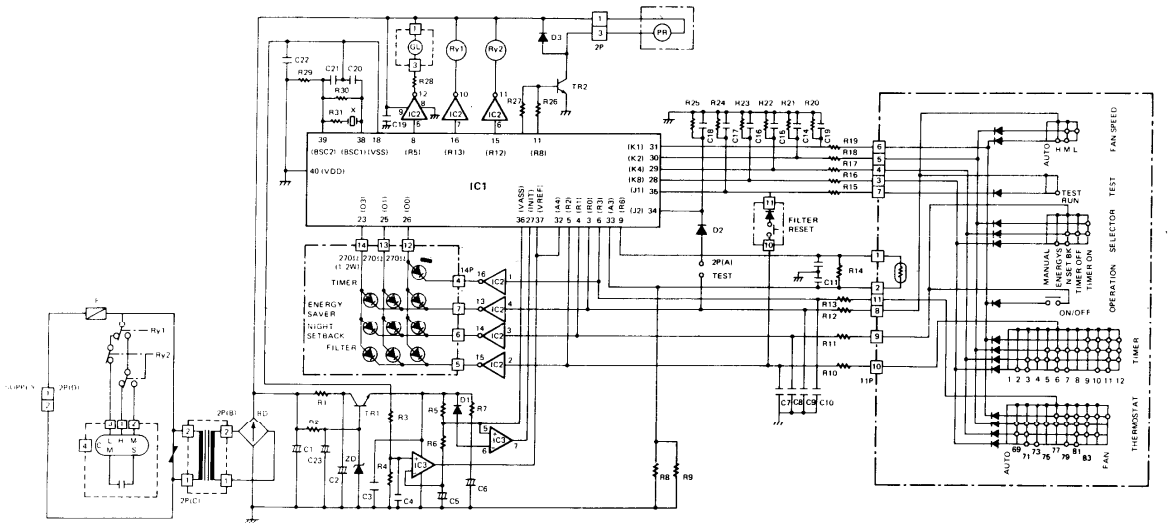
CONTROLLER P.C.B.(POW-12KU)

SAP91KC/SAP121KC

CONTROLLER PCB(PRINTED PATTERN)



ELECTRIC WIRING DIAGRAM(CONTROLLER PCB)



Key No.	Description			Key No.	Description			Key No.	Description			Key No.	Description
R1	Resistor	1W	100Ω	R20	Resistor	1/4W	56kΩ	C7	Capacitor	50V	0.0047μF	D1	Diode, DS442X
R2	Resistor	1W	1kΩ	R21	Resistor	1/4W	56kΩ	C8	Capacitor	50V	0.0047μF	D2	Diode, DS442X
R3	Resistor	1/4W	13kΩ	R22	Resistor	1/4W	56kΩ	C9	Capacitor	50V	0.0047μF	D3	Diode, DS442X
R4	Resistor	1/4W	10kΩ	R23	Resistor	1/4W	56kΩ	C10	Capacitor	50V	0.0047μF		
R5	Resistor	1/4W	3.6kΩ	R24	Resistor	1/4W	22kΩ	C11	Capacitor	50V	0.01μF	BD	Diode, DBA10C
R6	Resistor	1/4W	3.3kΩ	R25	Resistor	1/4W	10kΩ	C12	Capacitor	50V	0.022μF	ZD	Diode, GZA9.1Z
R7	Resistor	1/4W	56kΩ	R26	Resistor	1/4W	10kΩ	C13	Capacitor	50V	0.0047μF		
R8	Resistor	1/4W	39kΩ	R27	Resistor	1/4W	5.6kΩ	C14	Capacitor	50V	0.0047μF	TR1	Transistor, 2SD313EF
R9	Resistor	1/4W	6.8kΩ	R28	Resistor	2W	150Ω	C15	Capacitor	50V	0.0047μF	TR2	Transistor, 2SC2274
R10	Resistor	1/4W	100Ω	R29	Resistor	1/4W	5.6kΩ	C16	Capacitor	50V	0.0047μF		
R11	Resistor	1/4W	100Ω	R30	Resistor	1/4W	56kΩ	C17	Capacitor	50V	0.01μF	F	Fuse, 125V 3A
R12	Resistor	1/4W	100Ω	R31	Resistor	1/4W	100Ω	C18	Capacitor	50V	0.022μF	Ry1	Relay, LZG-24HE
R13	Resistor	1/4W	100Ω					C19	Capacitor	50V	0.047μF	Ry2	Relay, VB24TBU
R14	Resistor	1/4W	18kΩ	C1	Capacitor	50V	470μF	C20	Capacitor	50V	270pF	V	Varistor
R15	Resistor	1/4W	470Ω	C2	Capacitor	50V	1μF	C21	Capacitor	50V	100pF	X	Cristal
R16	Resistor	1/4W	470Ω	C3	Capacitor	50V	0.047μF	C22	Capacitor	50V	0.047μF		
R17	Resistor	1/4W	470Ω	C4	Capacitor	50V	0.022μF	C23	Capacitor	16V	10μF	IC1	IC, TMS 2600
R18	Resistor	1/4W	470Ω	C5	Capacitor	50V	1μF					IC2	IC, PA2004C
R19	Resistor	1/4W	470Ω	C6	Capacitor	50V	0.47μF					IC3	IC, LA6458D

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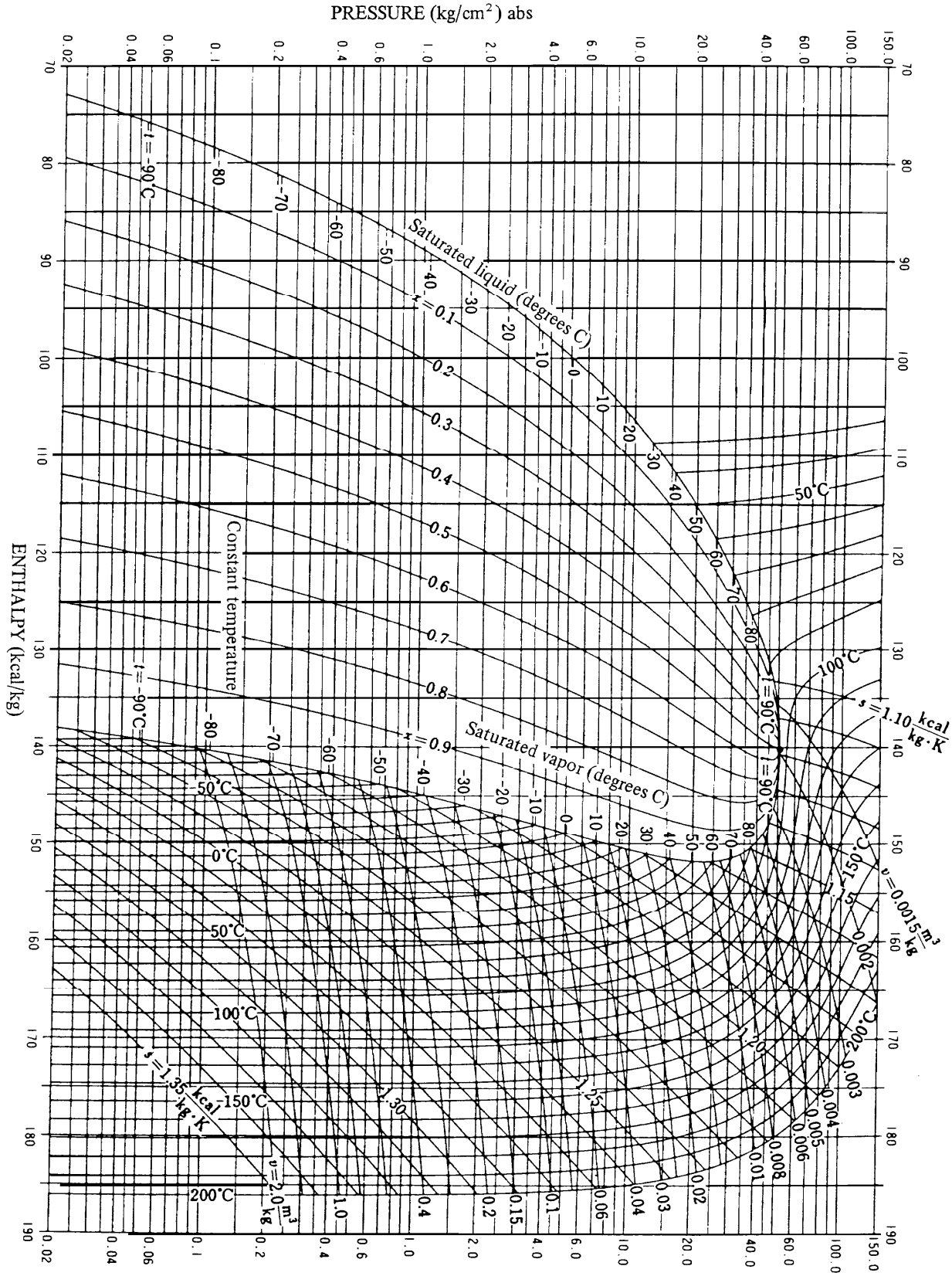
11.2. Freon 22 Pressure-Enthalpy Chart



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